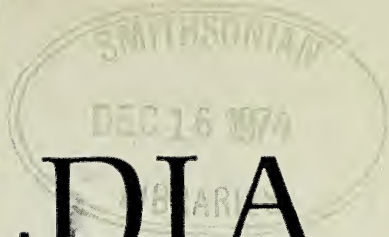


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A Tentative Key to the Cultivated Magnolias

The genus *Magnolia* was named by Linnaeus to commemorate Pierre Magnol, 1638–1715, a professor of botany and medicine and an early director of the botanical garden at Montpellier. Comprised of about 75 or 80 species, the genus occurs naturally in two widely separated areas; about 50 species are native in eastern Asia from Japan to the Himalayan region and southward to Java, while in North and Central America 25 or 30 additional species are known. Most of the species are apt and sought-after ornamentals, noted for their white, pinkish, purplish, or greenish-yellow flowers that are almost unrivaled in both size and beauty. Moreover, the ease with which some of the species hybridize has added to the popularity of the genus with plant breeders, and some of the finest ornamentals are the result of hybridizations.

The leaves of *Magnolia* also are noteworthy, since some species have leaves that are as large as those of any of our native or cultivated plants. Some of the deciduous species flower before the leaves expand in the spring, and the pastel-colored blossoms stand out against the delicate tracery of the branches, while in other deciduous and evergreen species, the flowers are produced against the luxuriant backdrop of the foliage. In late summer and fall, the interesting fruit aggregates divulge the red or orangish seeds and add to the ornamental value of the plants during that season. The densely pubescent flower buds of some deciduous species, moreover, make the dormant plants attractive during winter and anticipate, long in advance, the spring to follow.

The tentative key presented here is a result of an examination of the taxonomy of *Magnolia* for a projected manual of cultivated trees and shrubs. Since *Magnolia* is a genus that is an established favorite with gardeners and horticulturists, as well as botanists, it is hoped that publication of this key in its present preliminary form will allow interested individuals to test its utility with living specimens. I shall greatly appreciate com-



ments on the workability of the key as well as mistakes and oversights that become evident in it, so that they can be corrected for a final version.

Although there are several keys for the identification of the species of *Magnolia* (and comparisons of these with the present key will show my indebtedness to their authors), most are restrictive since they treat species of a particular region or botanical group. Dandy's key to the species of the genus, published in the *Journal of the Royal Horticultural Society*, is not readily available to the American public. The present key addresses itself to species cultivated in North America, north of tropical and subtropical areas. With the exception of Rehder's key in the second edition of his *Manual of Cultivated Trees and Shrubs*, there is no single reference for the identification of the taxa and hybrids of *Magnolia* either commonly or uncommonly encountered in temperate regions of North America. Most determinations of infrequently cultivated species, moreover, require consultation of monographs and numerous references scattered in the older botanical and horticultural literature.

All of the names of *Magnolia* included in Rehder's *Manual* have not been keyed or accounted for here largely due to some unresolved problems requiring further research and taxonomic judgement. Yet, the number of keyed taxa has been doubled from 19 in Rehder's *Manual* to 38 in the present key. Of these 38 taxa and hybrids, three were not treated by Rehder, while the ranks of some other taxa have been changed in accordance with the results of recent research into the taxonomy of the species by several investigators. The treatment prepared by Rehder for L. H. Bailey's *The Standard Cyclopaedia of Horticulture* (1914), which predates his treatment in the second edition of his *Manual*, keyed the 23 taxa then known in cultivation in a larger geographic area, but the taxonomy has since been modified and the nomenclature largely superseded.

Figure 1. *Magnolia*. a-m, subgenus *Magnolia*. a-i, *M. virginiana*: a, flowering branchlet, $\times 1/2$; b, flower with tepals removed to show androecium (many stamens removed) and gynoecium (carpels), $\times 2$; c, 3 stamens from adaxial side, showing lines of introrse dehiscence, $\times 3$; d, cross sections through anthers to show pollen sacs and vascular bundles, $\times 6$; e, longitudinal section of gynoecium showing 5 carpels, each with 2 ovules, $\times 3$; f, nearly mature fruit aggregate with longitudinal styler scars on the carpels, $\times 1/2$; g, mature fruit aggregate with pendulous seeds, $\times 1/2$; h, seed in longitudinal section showing seed coats, endosperm (dotted), and minute embryo, $\times 2$; i, seed with fleshy red outer coat removed, $\times 2$. j-l, *M. grandiflora*: j, bud, with stipular bud scale about to fall, $\times 1/2$; k, flower with tepals removed to show androecium (stamens) and gynoecium (carpels), half of the stamens removed, $\times 1$; l, stamens from adaxial side, showing lines of introrse dehiscence, $\times 2$. m, *M. tripetala*: stamen from adaxial side, $\times 3$. n-q, subgenus *Yulania*, *M. acuminata* var. *subcordata*: n, flowering branchlet, $\times 1/2$; o, opening flower bud showing reduced outer tepals, $\times 1/2$; p, stamen from adaxial side, showing lateral dehiscence, $\times 4$; q, cross section through anther, showing lateral dehiscence and 3 vascular bundles, $\times 8$.

Casual inspection of the key will indicate that nomenclatural changes and taxonomic judgements have affected the names by which several taxa are usually referred to in the literature and horticultural trade. In these few instances, pertinent synonyms and references to the literature are indicated in footnotes.

One of the problems encountered in preparing the key was deciding which species, taxa of a rank lower than species, and hybrids should be included. Documented specimens in the herbarium of the Arnold Arboretum have been the basis on which most taxa have been included. In other instances, published records of the occurrence of taxa in cultivation within the range of Rehder's *Manual* (including the plant inventories of several arboreta and botanical gardens produced in computerized form by the Plant Records Center) have been accepted as documentation. In general, a taxon has been included if there is good evidence of its occurrence or possible occurrence within our area.

Another problem of considerable concern has been the lack of treatment accorded cultivars. The purpose here is to provide a key for the identification of species and botanical varieties, some of the more distinctive hybrids, and in one instance a botanical form. Because of the difficulties surrounding their circumscription, cultivars have not been accounted for here. A bibliography has been appended to the key to serve as a guide to some of the literature where information concerning cultivars can be found. Unfortunately, in my opinion, altogether too many plants in the trade are listed and sold only under a cultivar name without any reference to the relationship of the plant to a botanically accepted species or hybrid group. This procedure is acceptable under the rules of the *International Code of Nomenclature of Cultivated Plants* — 1969, but the cultivar name alone (and they are in excess of one hundred in *Magnolia*) gives no indication of derivation or relationship. Hopefully, this key will enable the association of some cultivars with the taxon or hybrid group to which they belong.

Unfortunately, it has been impossible to construct a key using only vegetative, floral or fruiting characteristics; as a result, characters from the flowers and fruit aggregates, as well as from the vegetative parts, may be required for an identification. It is conceivable that an entire growing season may be necessary for the accurate and correct identification of a particular plant, and it is suggested that careful notes and a series of pressed herbarium specimens be made throughout the season to preserve flower and fruit characters as well as those of the leaves. Concomitantly, the different stages available should be used in conjunction with the key until a determination is made. Some of the characteristics used in the key are illustrated in Figure 1, and in these instances the appropriate drawings illustrating the character are referred to in the key.

A TENTATIVE KEY TO CULTIVATED MAGNOLIAS

1. Anthers dehiscing introrsely (Fig. 1, b, c, d, l, & m); flowers neither appearing before the foliage nor with an outer whorl of calyx-like tepals; leaves persistent or deciduous. 2.
2. Stipules adnate to the petioles, leaving scars on the upper surface of the petioles; leaves deciduous or persistent. 3.
3. Leaves persistent; flower buds enclosed in one or more stipular bud scales (Fig. 1, j), the scales leaving as many annular scars on the pedicel. 4.
4. One or more stipular bud scales enclosing the flower bud, leaving one or several annular scars on the pedicel; stipules large, extending almost the entire length of the petiole to the base of the blade. *M. Delavayi*.
4. One stipular bud scale (Fig. 1, j) enclosing the flower bud, leaving one annular scar on the pedicel; stipules very small, leaving obsolete scars on the petioles. *M. grandiflora* × *virginiana*.
3. Leaves deciduous (or sometimes persistent in *M. virginiana*); flower buds enclosed by one stipular bud scale (Fig. 1, j), leaving a single annular scar on the pedicel. 5.
5. Leaves crowded into false whorls at the ends of branches, the leaves large or very large, 20–100 cm. long. 6.
6. Leaves auriculate or cordate at base. 7.
7. Leaf blades, stipules, buds, and follicles finely pubescent. *M. macrophylla* (incl. *M. Ashei*).
7. Leaf blades, stipules, buds, and follicles glabrous. 8.
8. Stamens more than 8 mm. long; tepals more than 8 cm. long; fruit aggregate more than 6 cm. long. *M. Fraseri*.
8. Stamens less than 8 mm. long; tepals less than 8 cm. long; fruit aggregate less than 6 cm. long. *M. pyramidata*.
6. Leaves cuneate to rounded or rarely subcordate at base. 9.
9. Fruit aggregates to 10 cm. long; flowers with offensive odor. *Magnolia tripetala*.
9. Fruit aggregates over 10 cm. long; flowers fragrant. 10.
10. Ripe carpels with short beaks, usually less than 5 mm. long; indumentum, if present, not reddish-brown. 11.
11. Leaves mostly obovate; young branches and leaf petioles purplish. *M. hypoleuca*.¹
11. Leaves mostly elliptic-obovate, sometimes bilobed at the apex; young branches and petioles yellowish-green. *M. officinalis*.
10. Ripe carpels with long beaks, up to 8 mm. long; buds and leaves with reddish-brown pubescence. *M. rostrata*.
5. Leaves not crowded into false whorls at the ends of branches, the leaves generally 10–20 cm. long. 12.
12. Leaves deciduous or sometimes persistent, glaucous on the under surface; anther connectives with short, acute appendages (Fig. 1, c). 13.

13. Tepals up to 10 cm. long; leaf blades up to 20 cm. long, broadly elliptic to obovate.
M. × Thompsoniana.
13. Tepals up to 5 cm. long; leaf blades up to 15 cm. long, ovate to narrowly elliptic or lanceolate.
M. virginiana.
12. Leaves deciduous, the under surfaces pale green or somewhat glaucescent; anther connectives blunt or retuse at the apex (Fig. 1, p). 14.
14. Flowers pendent at anthesis, the fruit aggregates pendent; leaves with gray or silver-gray pubescence. 15.
15. Leaves elliptic with an acute apex; pubescence on under surface of leaves gray; branchlets dark brown.
M. Wilsonii.
15. Leaves obovate with obtuse apices; pubescence on under surfaces of leaves silvery-gray; branchlets light tan.
M. sinensis.
14. Flowers nodding or horizontal at anthesis (not fully pendent); leaves almost glabrous below and/or with the hairs with reddish-brown pigment at the base or conspicuously rufous. 16.
16. Leaves obovate to broad elliptic; under surfaces glabrescent, without conspicuous rufous pubescence along the midvein and major lateral veins; branches becoming light brown. 17.
17. Pedicels stout, ca. 5 mm. in diameter; leaves with 10–15 pairs of veins; tepals up to 6 cm. long; stamens ca. 2 cm. long.
M. × Watsonii.
17. Pedicels slender, ca. 2 mm. in diameter; leaves with 6–10 pairs of veins; tepals up to 5 cm. long; stamens less than 1 cm. long.
M. Sieboldii.
16. Leaves ovate to elliptic, the under surfaces pubescent with conspicuous rufous indumentum along the midvein and major lateral veins; branches becoming chocolate brown.
M. globosa.
2. Stipules free from the petioles, not leaving scars on the upper surfaces of the petioles; leaves persistent. 18.
18. Gynoecium stalked (stipitate), the stamens or stamen scars separated from the gynoecium by a short gap on the floral axis.
M. nitida.
18. Gynoecium sessile, the stamens or stamen scars occurring immediately under the gynoecium (Fig. 1, b, k). 19.
19. Carpels densely pubescent, the hairs extending onto the adaxial surfaces of the styles (Fig. 1, k); tepals 8–12 cm. long; fruit aggregate usually greater than 4 cm. long.
M. grandiflora.
19. Carpels sparingly pubescent, the styles glabrous; tepals 7–9 cm. long; fruit aggregate usually less than 4 cm. long.
M. grandiflora × virginiana.
1. Anthers dehiscing laterally or sublaterally (Fig. 1, p, q); flowers appearing before the foliage and/or with a much reduced calyx-like outer whorl of tepals (Fig. 1, o); leaves deciduous. 20.
20. Tepals subequal, the outer whorl not simulating a calyx; flowers appearing before the leaves (sometimes continuing in flower as the leaves expand); tepals white to rose or rose-purple. 21.
21. Leaves elliptic to oblong-ovate, usually rounded at the base and usually over 15 cm. long, with 12 or more pairs of lateral veins. 22.
22. Flowers large, up to 25 cm. in diameter with 12–16 tepals.
M. Campbellii (incl. *M. mollicornata*).³
22. Flowers up to 20 cm. in diameter with 9 tepals.
M. × Veitchii.

21. Leaves broadest above the middle, cuneate at the base and mostly under 15 cm. long, with not more than 12 pairs of lateral nerves. 23.
23. Flowers erect on the branches; leaves apiculate or abruptly short-acuminate at the apex. 24.
24. Tepals 9, tapering downward to a broadish base; flowers cup-shaped. 25.
25. Tepals subequal in length, white, occasionally with a rose coloration at the base.
..... *M. demudata*.
25. Three outer tepals somewhat shorter than the inner six, pink to reddish-purple outside, white within.
..... *M. × Soulangiana*.
24. Tepals 12 or more, much narrowed at the base; flowers saucer shaped. 26.
26. Flowers large, up to 20 cm. in diameter, the tepals rosy-pink outside, white within; leaves broadly obovate, villose along the main veins beneath, often with scattered hairs over the entire surface.
..... *M. Sprengeri* var. *diva*.⁴
26. Flowers up to 10 cm. in diameter, the tepals white both within and without, sometimes flushed with purple toward the base; leaves lanceolate to narrowly obovate, the lower surface glabrous or glabrate.
..... *M. Sprengeri* var. *elongata*.⁴
23. Flowers borne horizontally, nodding or pendent, occasionally erect; leaves usually rounded and often emarginate, rarely apiculate, at the apex. 27.
27. Leaves subcoriaceous or chartaceous, not strongly reticulate above, the under surface pubescent; tepals 10-16, white within, rosy-purple without. 28.
28. Slender, tall tree; leaves obovate; tepals 10-14, narrowly spatulate.
..... *M. Sargentiana* var. *Sargentiana*.
28. Large shrub or wide-spreading tree with several branches from the base; leaves oblong-obovate, tapering and slender; tepals 10-16, broadly spatulate and overlapping.
..... *M. Sargentiana* var. *robusta*.
27. Leaves coriaceous and strongly reticulate above, the under surface glabrous; tepals 9-12, white, flushed with rosy-purple outside.
..... *M. Dawsoniana*.
20. Tepals very unequal, the outer whorl shorter and simulating a calyx (Fig. 1, o), these outer tepals sometimes early deciduous; flowers appearing before or after the leaves. 29.
29. Flowers appearing before the leaves (sometimes continuing in flower as the leaves expand); inner tepals purplish or white, white tepals sometimes flushed at the base with rose or purple. 30.
30. Inner tepals 6, the outer 3 tepals not early deciduous and much smaller than the inner 6. 31.
31. Flowers purplish or sometimes nearly white, the outer 3 tepals petaloid, ca. one-half as long as the inner tepals.
..... *M. × Soulangiana*.
31. Flowers white, the outer 3 tepals greenish, sepal-like, less than one-half the length of the inner tepals (Fig. 1, o). 32.
32. Leaves lanceolate to lanceolate-elliptic, widest at or below the middle, tapering gradually to an acute apex; blades with hairs along the veins below, or finely appressed-pubescent or with scattered hairs over the entire surface below. 33.
33. Leaves coriaceous with hairs along the veins beneath; vegetative buds on mature growth densely silky-sericeous.
..... *M. Biondii*.
33. Leaves chartaceous, finely appressed-pubescent or with scattered hairs over the entire surface beneath; vegetative buds on mature growth glabrate or finely pubescent.
..... *M. salicifolia*.

13. Tepals up to 10 cm. long; leaf blades up to 20 cm. long, broadly elliptic to obovate. *M. × Thompsoniana*.
13. Tepals up to 5 cm. long; leaf blades up to 15 cm. long, ovate to narrowly elliptic or lanceolate. *M. virginiana*.
12. Leaves deciduous, the under surfaces pale green or somewhat glaucescent; anther connectives blunt or retuse at the apex (Fig. 1, p). 14.
14. Flowers pendent at anthesis, the fruit aggregates pendent; leaves with gray or silver-gray pubescence. 15.
15. Leaves elliptic with an acute apex; pubescence on under surface of leaves gray; branchlets dark brown. *M. Wilsonii*.
15. Leaves obovate with obtuse apices; pubescence on under surfaces of leaves silvery-gray; branchlets light tan. *M. sinensis*.
14. Flowers nodding or horizontal at anthesis (not fully pendent); leaves almost glabrous below and/or with the hairs with reddish-brown pigment at the base or conspicuously rufous. 16.
16. Leaves obovate to broad elliptic; under surfaces glabrescent, without conspicuous rufous pubescence along the midvein and major lateral veins; branches becoming light brown. 17.
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17. Pedicels slender, ca. 2 mm. in diameter; leaves with 6–10 pairs of veins; tepals up to 5 cm. long; stamens less than 1 cm. long. *M. Sieboldii*.³
16. Leaves ovate to elliptic, the under surfaces pubescent with conspicuous rufous indumentum along the midvein and major lateral veins; branches becoming chocolate brown. *M. globosa*.
2. Stipules free from the petioles, not leaving scars on the upper surfaces of the petioles; leaves persistent. 18.
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18. Gynoecium sessile, the stamens or stamen scars occurring immediately under the gynoecium (Fig. 1, b, k). 19.
19. Carpels densely pubescent, the hairs extending onto the adaxial surfaces of the styles (Fig. 1, k); tepals 8–12 cm. long; fruit aggregate usually greater than 4 cm. long. *M. grandiflora*.
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20. Tepals subequal, the outer whorl not simulating a calyx; flowers appearing before the leaves (sometimes continuing in flower as the leaves expand); tepals white to rose or rose-purple. 21.
21. Leaves elliptic to oblong-ovate, usually rounded at the base and usually over 15 cm. long, with 12 or more pairs of lateral veins. 22.
22. Flowers large, up to 25 cm. in diameter with 12–16 tepals. *M. Campbellii* (incl. *M. mollicomata*).³
22. Flowers up to 20 cm. in diameter with 9 tepals. *M. × Veitchii*.
21. Leaves broadest above the middle, cuneate at the base and mostly under 15 cm. long, with not more than 12 pairs of lateral nerves. 23.
23. Flowers erect on the branches; leaves apiculate or abruptly short-acuminate at the apex. 24.
24. Tepals 9, tapering downward to a broadish base; flowers cup-shaped. 25.
25. Tepals subequal in length, white, occasionally with a rose coloration at the base. *M. denudata*.
25. Three outer tepals somewhat shorter than the inner six, pink to reddish-purple outside, white within. *M. × Soulangeana*.
24. Tepals 12 or more, much narrowed at the base; flowers saucer shaped. 26.
26. Flowers large, up to 20 cm. in diameter, the tepals rosy-pink outside, white within; leaves broadly obovate, villose along the main veins beneath, often with scattered hairs over the entire surface. *M. Sprengeri* var. *diva*.⁴
26. Flowers up to 10 cm. in diameter, the tepals white both within and without, sometimes flushed with purple toward the base; leaves lanceolate to narrowly obovate, the lower surface glabrous or glabrate. *M. Sprengeri* var. *elongata*.⁴
23. Flowers borne horizontally, nodding or pendent, occasionally erect; leaves usually rounded and often emarginate, rarely apiculate, at the apex. 27.
27. Leaves subcoriaceous or chartaceous, not strongly reticulate above, the under surface pubescent; tepals 10–16, white within, rosy-purple without. 28.
28. Slender, tall tree; leaves obovate; tepals 10–14, narrowly spatulate. *M. Sargentiana* var. *Sargentiana*.
28. Large shrub or wide-spreading tree with several branches from the base; leaves oblong-obovate, tapering and slender; tepals 10–16, broadly spatulate and overlapping. *M. Sargentiana* var. *robusta*.
27. Leaves coriaceous and strongly reticulate above, the under surface glabrous; tepals 9–12, white, flushed with rosy-purple outside. *M. Dawsoniana*.
20. Tepals very unequal, the outer whorl shorter and simulating a calyx (Fig. 1, o), these outer tepals sometimes early deciduous; flowers appearing before or after the leaves. 29.
29. Flowers appearing before the leaves (sometimes continuing in flower as the leaves expand); inner tepals purplish or white, white tepals sometimes flushed at the base with rose or purple. 30.
30. Inner tepals 6, the outer 3 tepals not early deciduous and much smaller than the inner 6. 31.
31. Flowers purplish or sometimes nearly white, the outer 3 tepals petaloid, ca. one-half as long as the inner tepals. *M. × Soulangeana*.
31. Flowers white, the outer 3 tepals greenish, sepal-like, less than one-half the length of the inner tepals (Fig. 1, o). 32.
32. Leaves lanceolate to lanceolate-elliptic, widest at or below the middle, tapering gradually to an acute apex; blades with hairs along the veins below, or finely appressed-pubescent or with scattered hairs over the entire surface below. 33.
33. Leaves coriaceous with hairs along the veins beneath; vegetative buds on mature growth densely silky-sericeous. *M. Biondii*.
33. Leaves chartaceous, finely appressed-pubescent or with scattered hairs over the entire surface beneath; vegetative buds on mature growth glabrate or finely pubescent. *M. salicifolia*.

32. Leaves elliptic to obovate, widest above the middle, abruptly short-acuminate, acute, or rounded at the apex; blades with long hairs along the veins beneath. 34.
34. Leaves elliptic, up to 5 cm. wide, with the apex rounded to acute; upper and lower surfaces of the blade strongly reticulate. *M. cylindrica*.
34. Leaves elliptic or more commonly obovate, up to 10 cm. wide, with an abruptly short-acuminate apex, the under surface of the blade reticulate, the upper surface smooth. *M. Kobus* var. *Kobus* (incl. some forms of *M. × Loebneri*).⁵
30. Inner tepals (9-)11-20(-30), the 3 very much smaller outer ones often early deciduous. 35.
35. Leaves oblanceolate, widest above the middle, tapering gradually to a cuneate or acute base, the under surface glabrescent or with hairs along the veins; tepals 15-20(-30). *M. Kobus* var. *stellata* (incl. some forms of *M. × Loebneri*).⁵
35. Leaves elliptic, widest at or near the middle, tapering to a broadly cuneate or almost rounded base, the under surface finely appressed-pubescent over the entire surface with longer hairs along the veins; tepals 9-16. *M. × Proctoriana*.
29. Flowers appearing with or after the leaves; inner tepals purple or green to golden-yellow. 36.
36. Inner tepals green. *M. liliflora*.
36. Inner tepals purple. 37.
37. Stem of current year and previous year glabrous, with hairs only at the terminal bud scar and on the upper and lower adjacent internodes to this scar; tepals greenish to greenish-yellow throughout, or greenish-yellow outside and golden-yellow inside, 3-9 cm. long; pedicel glabrous or rarely villous; leaf tomentose to glabrous below. 38.
38. Leaves tomentose on lower surface; base rounded, truncate, cuneate, acute or rarely subcordate. 39.
39. Flowers greenish-yellow throughout. *M. acuminata* var. *acuminata*.⁶
39. Flowers greenish-yellow outside and clear golden-yellow inside on inner tepals. *M. acuminata* f. *aurea*.
38. Leaves glabrous or early glabrate with scattered hairs remaining on the veins beneath; base mostly rounded, truncate or subcordate, rarely cuneate or acute. *M. acuminata* var. *ozarkensis*.
37. Stem of current and previous year with short hairs or roughened with the bases of hairs; tepals greenish-yellow throughout or more often light yellow outside and golden-yellow inside, 2.5-7 cm. long; pedicel typically villous, rarely glabrous; blades tomentose beneath. *M. acuminata* var. *subcordata*.⁷

Acknowledgements

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- . Wyman's gardening encyclopedia. xv + 1222 pp. 16 *col. pls.* New York. 1971. [*Magnolia*, 678–682.]
- In addition to the references listed above, articles on *Magnolia* too numerous to mention individually have appeared in the following publications or special issues:
- American *Magnolia* Society. Newsletter of the American *Magnolia* Society. Vols. 1–9, 1964–1973, and continuing.
- Arboretum Bulletin, Univ. Washington Arb. Found. Vol. 10, No. 4. 1947. "Special *Magnolia* Number."
- Journal of the California Horticultural Society Vol. 23, No. 1. 1962. [Entire issue devoted to articles on *Magnolia*.]

Notes

- 1 *Magnolia hypoleuca* Siebold & Zuccarini is the correct name of the taxon that is often referred to and sold as *M. obovata* Thunberg. The name *M. obovata* Thunberg is superfluous.
- 2 The correct name is *Magnolia Sieboldii* K. Koch, not *M. parviflora* Siebold & Zuccarini, which is a later homonym.
- 3 The inclusion of *Magnolia mollicomata* within *M. Campbellii* follows the treatment of J. E. Dandy, *Notes Roy. Bot. Gard. Edinb.* 16: 123, 124. 1928.

- 4 A nomenclatural problem exists in the treatment of *Magnolia Sprengeri* that may be solved by examination of the type specimen. No typical variety (var. *Sprengeri*) has been designated, and if one of the two varieties recognized here corresponds with the type of the species, it automatically would be designated var. *Sprengeri*.
- 5 For the rationale behind the treatment accorded *Magnolia Kobus* and its var. *stellata*, see B. C. Blackburn, *Amatores Herbarii* 17: 1, 2. 1955, and *Baileya* 5: 3-13. 1957. *Magnolia* \times *Loebneri* represents forms that link the two varieties.
- 6 The treatment of *Magnolia acuminata* followed here is essentially that of J. W. Hardin, *Jour. Elisha Mitchell Sci. Soc.* 70: 298-312. 1954.
- 7 The correct name of *Magnolia cordata* Michaux, when treated as a variety of *M. acuminata*, is var. *subcordata* (Spach) Dandy, *Am. Jour. Bot.* 51: 1056. 1964, not var. *cordata* Sargent, *Am. Jour. Sci.* III. 32: 473. 1886.



Materials for Chair Seat Weaving

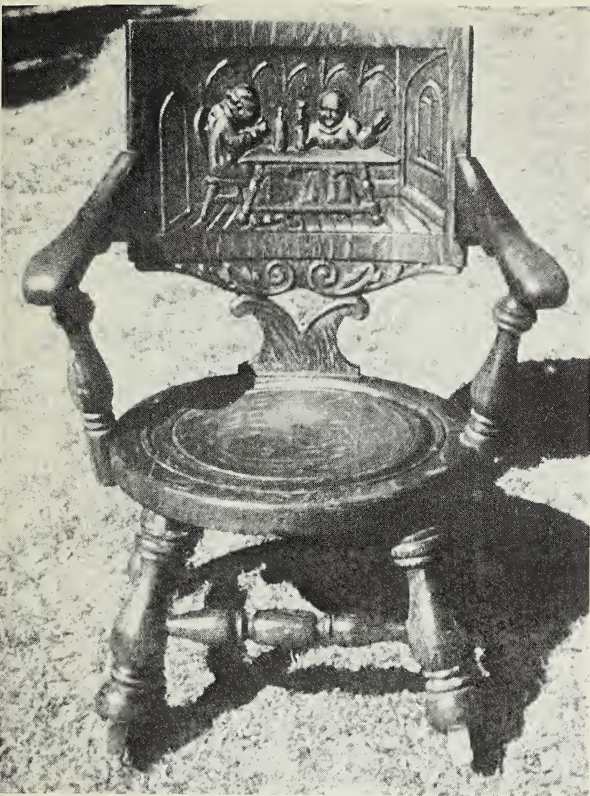
When temporarily at rest, Man first sat cross-legged on the ground or squatted on his haunches — the latter still a preferred resting posture in much of the Orient. In Egypt, several millennia before the birth of Christ, the lightweight, frame chair evolved with the seat frame filled in with cords made of twisted leaves of marsh plants (*Juncus*, *Cyperus*) or of palms. Cabinet-making did not evolve to that point in Europe for many centuries. Instead, stools and benches were made of crude boards or split logs with wooden pegs for legs. Chairs with wooden (plank) seats and backs began to appear as cabinet-making evolved in the Occident, and were used by ecclesiastic and lay nobility as a prerogative of rank.

It was not until the 17th century A.D. in Europe and somewhat later in the American colonies that the less cumbersome frame-seated chair like that developed by the Egyptians came into general use. An attempt then was made to find material to fill in the seats and backs.

Probably the first material used in Europe for weaving the seats was osier. Osier can be obtained from nearly any species of willow, if properly prepared. *Salix viminalis*, commonly called osier, and *S. vitellina*, the Yellow Willow, were the materials of choice for early craftsmen, who had long used them for basket-weaving. Still grown commercially, chiefly in Europe, these willow species can be seen at the Arnold Arboretum in the field opposite the administration building.

In the production of osiers, plants are started by taking one-foot sections of one-year-old shoots or branches. These are planted on two-foot centers in rows 18 inches apart. From each cutting one or two shoots should be allowed to develop. At the beginning of the third growing season, the sprouts are cut back to two or three buds from the base. Long new sprouts will arise from the remaining buds on the plant, and the process is repeated again each succeeding year.

The cut sprouts, known as "raw" osier, should have the bark stripped off after which they may be stored dry for a long period. Boiling the stems before stripping, a process known as



Wooden seat and carved wooden back, old German chair. Photo: R. E. Wheeler.



Splint-seated high chair — early American. Photo: R. E. Wheeler.

buffing, makes this operation easier and imparts a pleasant brown color to the material.

When used for seating, the osiers are used whole or split lengthwise in two or into four pieces and are soaked for some hours in water to make them more pliable.

Osier at its best produced a coarse weave that must have been uncomfortable to sit on; though the heavy homespun clothing of the period when it was chiefly used perhaps made it more tolerable. There were other disadvantages, too, not the least of which was the tendency of the woven twigs to crack and break. At any rate osier was soon displaced for chair seating by more durable products, and the sturdy old chairs on which it was used are hard to find now, even in antique shops.

Osier was soon replaced by flat splints, another material borrowed from basket-making. These were made by removing the outer bark from young trees three or four inches in diameter. The stems, cut to the required length, were then beaten all over with a mallet to destroy the vessels of the spring wood in the annual rings. This treatment separated the annual rings one from another; the rings then were split up into strips to be dried and sliced lengthwise into ribbons of even width. After being soaked in water, these strips were rendered pliable enough to weave around the seat frames to make more attractive, comfortable and durable seats than those of willow. The rest of the tree was not wasted: ash and hickory wood made the best plough and axe handles, and chair parts. The fragile-looking Hitchcock chairs owe their durability to these rugged woods as much as to the care with which they were assembled.

The hickories were favored among early substitutes for willow because their strips or splints were tougher and longer-lasting in use. Species most commonly employed were *Hicoria lacunosa*, shellbark, *H. glabra*, pignut, and *H. ovata*, shagbark; this last, a favorite because its outer bark was so easily removed. Specimens of these three may be seen today in the collections at the Arnold Arboretum.

Conservationists will be happy to learn that splints from these valuable trees have in turn been replaced by even more practical materials, also of plant origin. True splints now are only available on special order, if at all.

A singular variant on the splint seat came about when the Shakers in Pennsylvania began weaving comfortable and easily replaced chair seats out of heavy cotton ribbon. When the warp and woof ribbons were dyed in contrasting colors, the various kinds of weave (basket, herringbone, etc.) produced an effect



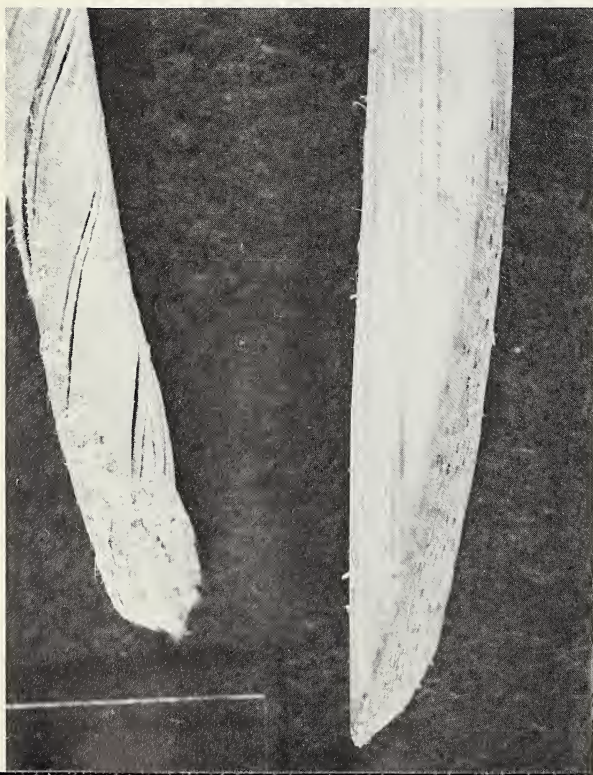
Left to right: Round reed; flat reed; coarse cane; fine cane.



*Left: Flat reed.
Right: Coarse cane.*



Scirpus americanus. Photo: R. E. Wheeler.



Left: Fibre rush.
Right: Reed.

quite gay for such an austere sect. This type of ribbon can still be purchased at the Shaker Shop on the Common in Concord, Massachusetts.

Splint, in turn, was displaced in Europe and the American colonies by twisted cords of marsh plant leaves much as the Egyptians had used them centuries before. The long, narrow leaves of several species of bulrush, cat-tail and even of wild iris were used. Favored in America were bulrushes of the genus *Scirpus*; indeed *S. americanus* came to be known as the "chair-maker's rush". Leaves of cat-tail, particularly the species *Typhus angustifolia*, furnish the bulk of natural "rush" commercially available today.

Ardent workers don't need to buy the material, however, for this plant grows abundantly in marshes and water-filled roadside ditches. The leaves are harvested toward the end of August when they begin to turn brown at the tips. They are dried in the shade outdoors or in attic or cellar indoors to preserve the pleasant green color, and stored away from any dampness that might make them moldy. Properly cured and stored they can be used for a year or more.

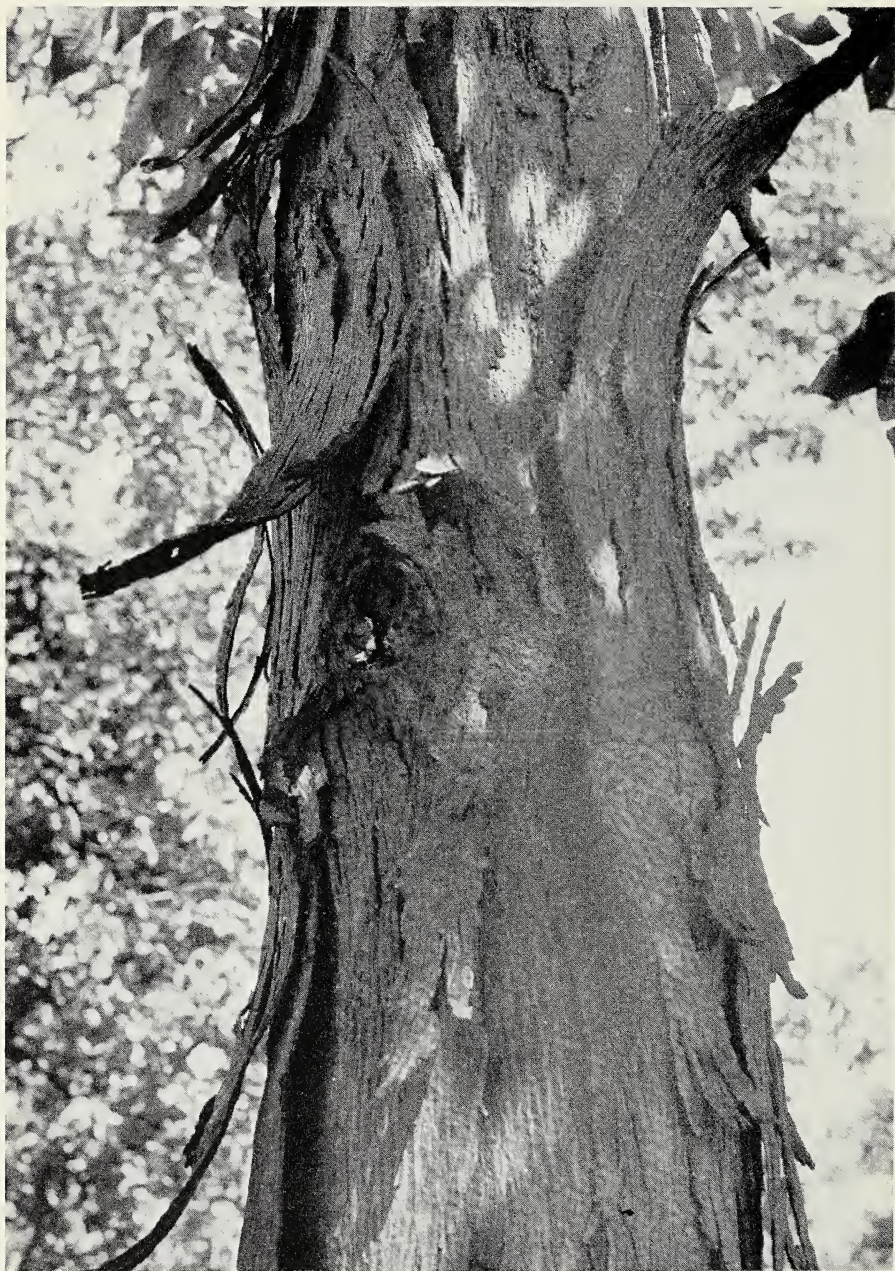
The weaving of a chair seat with natural rush is done with a continuous cord composed of two or three moistened, tightly twisted rush leaves to which new leaves are added progressively to maintain a uniform cord size. The cord is carried over and under the frame rails in figures-of-eight at each successive corner around the chair until the whole seat is filled in.

The knack of producing an even thickness of rush cord is not readily mastered by the amateur. Fortunately there is a practically indistinguishable substitute made of another vegetable material — tightly twisted, tough paper commercially known as "fiber".

The need for proper preservation of both natural rush and fiber seats is not generally understood. Routinely given a coat of shellac, the interval between coats depending on the degree of use, these seats will last indefinitely; otherwise they need periodic replacement.

When American clipper ships spurred trade with the Orient, a revolution in chair making and weaving began. Among other cargoes, they brought back rattan which is derived from the stems of a number of climbing palms native to the East Indies. Entire chair frames, legs and backs could be made from the tough stems as well as walking sticks, polo sticks, ski poles, etc.

The outermost layer or rind of these plants is a hard, shiny substance which is taken off in strips and becomes the "cane"



Carya ovata. Photo: H. Howard.

sold commercially for basket-weaving and chair seating. Cane can be obtained in widths from "superfine" — barely a millimeter wide — to "coarse" about 5 millimeters wide. The last are almost the size of narrow splints, for which they can be substituted. Cut into long strips of even width, cane is strong, pliable (when moistened), durable (wet or dry) and requires no maintenance.

The weaving of cane-seated chairs was done originally by threading double strands of cane through evenly spaced holes in the front and back of the seat frame to make what, in cloth-weaving terminology, would be called the "warp". The "woof" strands then were woven in through similar holes in the side frames. The weave was further strengthened by two diagonals producing the durable and attractive hexagonally-holed pattern.

During the last few decades this difficult weave has become available in machine-made sheets which are simply cut somewhat oversized, wedged into grooves in the side rails, and glued with splines to hold the cane in place. Beautiful reproductions of antique chairs are sometimes sold as genuine antiques; but if the seat is retained with splines instead of holes through the frame, the fraud can be readily detected.

Either type of cane seat would be virtually indestructible if the manufacturers took the trouble to round the inner edges of the seat frame. The weight of the occupant tends to cut the cane against a sharp-edged frame, particularly at the front of the chair, and periodic replacement becomes necessary.

When the rind of rattan stems is removed to produce cane, the tough fibrous inner portion is cut in various shapes and widths. Long, flat strips become the flat "reed" of commerce — an ideal substitute for the hickory and ash splints of long ago and far less expensive. Long pieces, round in cross-section, become the round "reed" of commerce — ideal substitutes for osier which is available here only as an import.

Finally, the Orient has provided a partial substitute for natural rush in the form of "Hong Kong Grass". This is made from the fine twisted leaves of salt-marsh grasses. While it is only available in a thin, string-like gauge of any specified length, it is surprisingly strong and can be purchased in a variety of colors. It is often used either in an open or closed weave on modern chairs. This product is not to be confused with Raffia — a less substantial material made by stripping and drying the cuticular layer from the leaves of the Madagascar palm, *Rhaphia raffia*, or the Japanese one, *R. taedigera*. Raffia has more basketry than chair seat applications, but can be used as part of the binding-off strip around the edges of cane seats.



Salix purpurea lambertiana. Photo: H. Howard.

Today many homes have at least one chair, often of antique value, which has lost favor because its seat is no longer sound. Years ago this would not have posed a problem; but the current shortage of craftsmen able to make authentic and durable repairs almost dictates that we learn the craft ourselves.

It is an extremely interesting and challenging hobby, as well as a practical occupation; one particularly suited to the elderly or handicapped. A little patience, modestly-priced materials, and a few simple tools found in every household are all that are needed for the work.

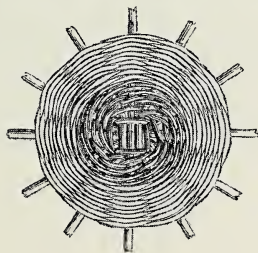
Expert guidance and advice are obtainable at adult education courses; several books also detail the procedures clearly. The author recommends *Seat Weaving* (II), by L. Day Perry (Washington, D.C.: Hobby House Press 1940) and *Chair Seat Weaving for Antique Chairs* by Marion Burr Sober (Michigan Graphic Corporation, Whitmore Lake, Michigan 1964). In addition, *Yankee* and *Early American Life* magazines periodically carry advertisements of mail order firms * offering the supplies which sometimes are difficult to procure locally.

It is hoped that the foregoing historical and practical notes also will assist the novice in his restorative efforts.

RALPH E. WHEELER, M.D.

(Dr. Wheeler, a resident of Brookline, is Emeritus Professor of Bacteriology at the Tufts University Medical School. His hobby is the restoration of antique chairs.)

* The traditional supplier in New England is the H. H. Perkins Co., 10 South Bradley Rd., Woodbridge, Conn. 06525. Its catalog lists most of the materials discussed in this note as well as tools and kits containing chair parts of early American antique reproduction for do-it-yourself assembly; also, books on seat weaving and on furniture refinishing (often a necessary preliminary to replacing the seats of antiques).



The Shadbushes

As I was growing up in the rich farming country of southeastern Pennsylvania, one of my greatest pleasures was to walk through the fencerows and woodlots in April, searching for signs of spring. Herbs like Hepaticas and Bloodroots were always welcome finds, but I will never forget the Shadbushes. Looking across the brown and gray countryside to a woodland lined with these trees in full bloom never failed to lift my winter-weary spirit. Ever since, I have looked on these plants with a special fondness, a prejudice that may color some of my statements and descriptions in the present article.

These attractive members of the Rose Family are known by a variety of common names: Serviceberry or its corruption, Sarvisberry, from the resemblance of the fruit (not actually a berry) to that of the European Service-tree, a species of *Sorbus*; Juneberry, because the fruits of several species ripen in June; and Shadblow or Shadbush, because most species in the eastern United States started to bloom as the shad began to ascend the rivers. My preference for the last of these is based merely on a personal prejudice. It was the name by which I first learned the plants, and it is somewhat more romantic than the rest. The generic name *Amelanchier* is probably derived from "amelanche", the name of the European species in Provence, a section of southeastern France.

Like so many of our native trees and shrubs, the Shadbushes have been largely neglected by gardeners, even though they are of considerable ornamental value. Most of the species are colonial shrubs, spreading by woody underground stems which send up innumerable aerial shoots, often forming dense clumps or small thickets in the process. A group of species, however, grow into small or medium-sized trees, usually with one or two trunks, but occasionally with more.

The arborescent species are probably the best from an ornamental viewpoint. The flowers appear in late April in New England when no other trees, except for the early Cherries and Magnolias, provide a spectacular showing. Although the flowering period may be short, perhaps only three or four days if the



The airy elegance of Amelanchier arborea in full bloom. Photo: H. Howard.

weather is hot or rainy, the display, in my opinion, is incomparable. It is a soft and delicate show, without the gaudiness of a Magnolia or a Crab Apple, entirely in tune with its season. One of the most beautiful sights in the Arnold Arboretum is the specimen of *Amelanchier arborea* planted on the edge of the Junipers near Bussey Brook. This tree, 30 feet tall and with a trunk diameter of 15 inches, is covered with a misty shroud of white in late April. To one driving or walking up Bussey Hill, it stands like a beacon among the drab brown of the field and the green of the conifers.

With their wonderful floral display in the springtime; the delicious fruits in early summer; the brilliant red-orange of the foliage in the fall; the smooth, soft gray, somewhat striped bark in the winter; and the tidy, graceful shape always, these are trees for all seasons. If one wanted a medium-sized specimen for a large or small yard, I could hardly think of a more beautiful plant. In a naturalized setting, by a pond or the edge of a woodland, only a Dogwood could be better.

The shrubby species of Shadbush are of somewhat lesser ornamental value. Although they are attractive in flower, and the fruits in some cases are superior to those of the arborescent species, there are many shrubs with a more durable, colorful bloom that would be more desirable for the average gardener. If used in a naturalized planting, however, all species can be very effective, and the tall, fountain-shaped *Amelanchier canadensis* would be suitable as a specimen plant or a deciduous screen.

All Shadbushes are susceptible to attack by a number of pests common to many rosaceous trees, which limits their usefulness. Lacewing fly, red spider, various scales, and fireblight all can become serious problems; if any of these are rampant in an area, Shadbushes, or any other rosaceous plants, should be planted with caution.

The fruit of the Shadbush is not a berry, as implied by the common names "Juneberry" and "Serviceberry"; rather it is a small pome, the technical name for a type of fruit found only in certain plants of the Rose Family, including Pears, Apples, Hawthorns, Mountain Ashes, and Pyracanthas, as well as Shadbushes. In most of the species they are 1/4–3/8 inch in diameter, firm but juicy in texture, sweet tasting, and basically dark red-purple in color, but thinly covered with a bluish, waxy bloom, as in blueberries and grapes. The fruits are high in Vitamin C content and were used as food to some extent by the American Indians of the eastern forests, as well as by the early



The smooth, striped bark of a mature Amelanchier arborea. Photo: P. Bruns.



settlers. But it was the Indians of the prairies, with a dearth of other fruits to choose from, who used them most extensively. They crushed the fruit of *Amelanchier alnifolia* with dried bison meat and fat; the resulting mixture, called pemmican, served as their primary winter food. The Cree name for the fruits was *Mis-sask-qua-too-min*, or some similar phonetic rendering. Shortened to "saskatoon" by the fur traders, the name is still used to refer to *A. alnifolia*, and it was given to a city in Saskatchewan in whose environs the plant was abundant.

There has been some interest recently in growing several species of *Amelanchier* as commercial crops. Several cultivars have been named on the merits of their superior fruit. The earliest, "Success", a cultivar of *A. canadensis*, was offered for sale as early as 1878. The flowers are resistant to late frosts, and the fruits ripen evenly making them amenable to mechanical harvesting. However, the fruits deteriorate in flavor rapidly upon standing, limiting their commercial possibilities. So Shadbushes probably will remain basically a "home crop." The fruits are delicious when served fresh, and they make excellent preserves. They also can be used like more traditional fruits as a pie filling, or in muffins, much like blueberries.

The fruits of the Shadbushes are attractive to a wide variety of birds. This may be good or bad, depending on one's point of view. They generally last only a very short time here at the Arboretum. If a homeowner wishes to save the fruits for his own use, at least in a quantity large enough to make the effort worthwhile, it may be necessary to cover the plants with a cheap netting as the fruits are maturing. If one is interested in planting trees or shrubs to attract birds, a species of Shadbush would be a good choice. But a word of caution from a friend of mine: do not plant such a tree near a patio or any other place where one would like to sit out on a pleasant late June evening. The fruits have rather an immediate effect on the birds.

Most of the 20–30 species of *Amelanchier* are native to North America, but three species are found in Europe, North Africa, and southwestern Asia, and another in Japan, Korea, and China. All the American species are mostly closely interrelated and quite similar in general appearance. Therefore their identification is difficult for the layman. In addition, hybrids occur between many of the species, both in the wild and in cultivation. These hybrids are usually intermediate between their parents in many respects, making identification even more difficult.

Below is a list and a key to the identification of the species of Shadbush which are most commonly encountered in cultivation



Amelanchier arborea (as *A. canadensis*), from the *Silva* of North America by C. S. Sargent. 1, flowering branch; 2 floral diagram; 3, vertical section of flower; 4, stamens; 5, cross section of ovary; 6, ovule; 7, fruiting branch; 8, vertical section of fruit; 9, cross section of fruit; 10, seed; 11, embryo; 12, winter buds.

in the Northeast. [For a summary of how to use a key, as well as an explanation of terms, see the March, 1972 issue of *Arnoldia* (Volume 32, pp. 59-97).] The key makes use of flower, leaf, and fruit characters. Therefore for identification it is necessary to make observations, perhaps aided by photographs and pressed specimens, at different seasons of the year. Keys of this sort are frustrating to use, but in the case of difficult plants like the Shadbushes, they are frequently the only ones possible to construct.

KEY TO THE SPECIES OF AMELANCHIER MOST COMMONLY CULTIVATED IN THE NORTHEAST

1. Flower clusters held horizontally or slightly drooping; plants tree-like, usually with 1-5 trunks, sometimes shrub-like with many trunks, but at maturity more than 12 feet tall.
 2. Unfolding leaves densely hairy.
 3. Unfolding leaves bronze or purplish. *A. × grandiflora*.
 3. Unfolding leaves green or silvery white.
 4. Fruits dry and insipid; mature leaves hairy beneath, at least along the veins. *A. arborea*.
 4. Fruits juicy and sweet; mature leaves not hairy, except perhaps on the stalk. *A. asiatica*.
 2. Unfolding leaves not or only sparsely hairy. *A. laevis*.
1. Flower clusters held erect; colonial or clump-forming shrubs, with many stems, often less than 6 feet tall.
 5. Stalks of fruits and mature leaves hairy. *A. ovalis*.
 5. Stalks of fruits and mature leaves not hairy.
 6. Petals 1/2 inch long or longer. *A. sanguinea*.
 6. Petals 3/8 inch long or less.
 7. Top (in the area between the tooth-like projections) of the fruit hairy; low shrubs, less than 6 feet tall. *A. spicata*.
 7. Top of the fruit not hairy; tall shrubs, more than 6 feet tall at maturity. *A. canadensis*.

Amelanchier arborea. Downy Shadbush. Found in dry to moist woods or clearings throughout the eastern half of the United States (west to Iowa and Oklahoma), this species is generally a shapely small tree in cultivation. Although seldom growing more than 30 feet tall, the largest recorded specimen, growing near Standish, Michigan, is 48 feet tall with a trunk circumference of 10 1/2 feet and a spread of 76 feet. The name *A. canadensis* has been applied erroneously to this plant by many authors, including Alfred Rehder in his *Manual of Cultivated Trees and Shrubs*. It may be distinguished from *A. laevis*, the only other arborescent Shadbush native in the Northeast, by the downy, silvery-white unfolding leaves and the dry, insipid fruits.

It was cultivated in England as early as 1746, and probably earlier in this country. At the Arnold Arboretum the tree blooms from early April to early May, and the fruits are ripe in mid-June.

Amelanchier laevis. Alleghany Shadbush. Similar to and often confused with the preceding, this species grows in woodlands and thickets from Newfoundland and Minnesota southward to Missouri and Indiana, and in the Appalachians to Georgia. It holds the record for size among Shadbushes. The largest individual, from Siler's Bald in Great Smoky Mountains National Park, is 60 feet tall with a circumference of 6 feet, 2 inches. Its bronze-colored unfolding leaves and delicious fruit, as well as the spectacular floral display, make this one of the more desirable of the Shadbushes. At the Arnold Arboretum it blooms from late April until mid-May, and the fruits appear in late June.

Amelanchier X *grandiflora* (also known as *A. confusa* and *A. lamarckii*). Apple Shadbush. This is apparently a hybrid between the above two species. The type specimen was collected in the Botanical Garden of the Forest Academy at Muenden, Germany, but the plant is also known in the wild. Specimens have been collected in several states from New Hampshire to Missouri and Georgia, and it is apparently naturalized in parts of Europe. It is more floriferous than its parents, the fruits are larger and more succulent, and the unfolding leaves are purplish. All in all, it is probably the handsomest of the Shadbushes. A form of this plant, 'Rubescens', found as a spontaneous seedling in Seneca Park, Rochester, New York, has flowers which are purplish-pink in bud and suffused with pink when open.

Amelanchier asiatica. Asiatic Shadbush. A native of Japan, China, and Korea, this plant was introduced into the United States in 1865. It is not common in cultivation. It is similar to *A. arborea*, but it has palatable fruit and blooms somewhat later.

Amelanchier canadensis (*A. oblongifolia*). Thicket Shadbush. A species of bogs, swamps and other low areas chiefly in the Atlantic Coastal Plain from Newfoundland to Georgia, this differs from all of the preceding in that it is never treelike, although it may grow to be 25 feet tall. In the wild it often forms dense clumps, hence its common name. This same attribute makes it desirable in cultivation where a tall, deciduous screen is wanted. It was reputedly cultivated in this country as early as 1641, the succulent fruits undoubtedly providing a welcome addition to the diet of the early settlers. In the Arnold Arboretum this



Amelanchier arborea, shown here, and several of its close relatives form tidily shaped, small to medium-sized trees. Photo: P. Bruns.

species blooms during the first half of May and the fruits ripen in early July.

Amelanchier sanguinea. Round-leaved Shadbush. Native to woods, thickets, and lake shores from Maine westward along the Great Lakes to Minnesota, with a few isolated stations in the mountains of North Carolina, this is perhaps the best of the shrubby species for general cultivation. It is of medium height (3-9 feet), it has large flowers, and the fruits are particularly tasty. Here it blooms during May and the fruits ripen in mid-July.

Amelanchier spicata. Low Shadbush. A low, colonial shrub, growing from 1-6 feet tall, this species occurs in woods and thickets, sandy barrens, dunes, and other open places in eastern North America from Newfoundland to the eastern Dakotas, south to Missouri, Ohio, and Georgia. The correct name for this plant is the subject of considerable debate. Some authorities break it down into several species, with names including *A. stolonifera* and *A. humilis*. And, due to confusion as to the identity of the plant which the original author had in mind, some botanists use the name "*spicata*" to refer to an entirely different plant, a hybrid between *A. canadensis* and *A. ovalis*. At the Arnold Arboretum this species blooms during the first half of May and the fruits ripen in early July.

Amelanchier ovalis (*A. vulgaris*). Snowy Mespilus. The only Shadbush native to Europe, this species is rarely cultivated in the United States. It is an attractive shrub with large flowers and palatable fruits, and it was grown in Europe as early as the 16th century. In this country it grows to 6 feet tall; it blooms in early May and the fruits ripen in late June.

One or more of the above species is offered for sale by many nurseries. Raymond Nelson, in DuBois, Pennsylvania even specializes in one of them (probably *Amelanchier laevis*) which he calls the "Sarvistree".

RICHARD E. WEAVER, JR.

Dykes Medal Iris at the Case Estates

The highest award an iris can receive in the United States is the Dykes Medal sponsored by the American Iris Society. Usually the long climb upward to this honor begins when the iris receives the High Commendation (H.C.) award as an unintroducted seedling. Once it has been introduced it can be considered for the Honorable Mention (H.M.) award. After this award is given, two years must elapse before it is eligible for the Award of Merit (A.M.); a maximum of twelve iris may receive this award in a single year. Again, two years must pass after winning the A.M. before a plant is eligible for the Dykes Medal; only one medal is allowed each year.

More than 500 named cultivars of iris are introduced into commerce annually, so one can understand how small the chance is that an iris will eventually win the Dykes Medal. When dealers list an iris as having recently won this coveted award, one can be reasonably sure that it is excellent from almost all standpoints. A gardener should feel confident when buying such an iris that it is an aristocrat.

The American Iris Society has registered more than 600 authorized judges in the United States, many of whom have wide leanings regarding their likes and dislikes in iris. If, when the votes are finally tabulated for the Dykes Medal, no variety receives at least 15 percent of all the votes, the award is not given that year. This situation occurred in 1946, 1960 and 1969.

Formerly, the Arnold Arboretum attempted to maintain a collection of all the Dykes Medal winners from 1927 to the present in the display area of the Case Estates in Weston, Massachusetts. This was not only difficult but of questionable value to the average gardener. Some of the older cultivars like 'San Francisco', which won the award in 1927, were bred in California and were either trying or impossible to grow in our New England climate. Other older varieties had little appeal except from a historical standpoint. If a gardener took a liking to one of these, chances were it would have been unavailable in the trade for a long time; even award winners going back much beyond 15 years are not readily obtained.



Iris 'Winter Olympics'. Photo: G. Pride.



A new bed of Dykes Medal iris has been established at the Case Estates in the area near the daffodil collection. Starting with 1957, an arbitrarily selected year, the line up is as follows:

- 1957: 'Violet Harmony', a New England-bred, lavender-violet.
- 1958: 'Blue Sapphire', a heavy substantiated light blue.
- 1959: 'Swan Ballet', a ruffled white self.
- 1960: no award
- 1961: 'Eleanor's Pride', a New England-bred, powder-blue with a white beard.
- 1962: 'Whole Cloth', a new pattern in white and medium blue.
- 1963: 'Amethyst Flame', of subtle lavender and rosy-violet shades.
- 1964: 'Allegiance', ultra-marine blue.
- 1965: 'Pacific Panorama', a large, ruffled sea-blue.
- 1966: 'Rippling Waters', an outstanding blue-orchid and cream blend.
- 1967: 'Winter Olympics', an intensely ruffled, large white self.
- 1968: 'Stepping Out', an excellent snow-white with blue-violet markings.
- 1969: no award
- 1970: 'Skywatch', a very large, ruffled lavender self.
- 1971: 'Debby Rairdon', a beautiful white and soft yellow.
- 1972: 'Babbling Brook', a ruffled blue.
- 1973: 'New Moon', a large ruffled, light yellow self.

It takes so long for an iris to receive a Dykes Medal that usually ample stock is available in the trade by then, and the price is reasonable considering the high quality of the cultivar.

We were fortunate to have all these varieties donated by members of the "Friends of the Arnold Arboretum" so that no expense was involved in obtaining the rhizomes.

The tall bearded iris generally are in full flower during the first week in June; an excellent time to view this small but potentially effective display.

GEORGE H. PRIDE

Arnoldia Reviews

The Leaf Book: A Field Guide to the Plants of Northern California. Ida Geary, with a forward by David Cavagnaro. Fairfax, California: A. Philpott, The Tamal Land Press. 1972. 388 pages, softbound. \$5.50.

The idea of "nature printing", making prints directly from leaves or entire plants, is not a new one. Wilfrid Blunt, in *The Art of Botanical Illustration*, states that the process was developed as early as the 15th century and was periodically rediscovered, refined, and modified during the 18th and 19th centuries, culminating in von Ettinghausen's *Physiotypia* of 1853-73. Ida Geary, the authoress of the present book under notice, credits Leonardo da Vinci as the first to experiment with the process. Basically, it involves applying a pigment or some transferable substance, whether it be an ink or soot from a candle, to the surface of a pressed or living plant surface and then laying the plant on paper and pressing or rubbing an impression onto the paper.

The Leaf Book is purportedly, as the subtitle states, a guide to the plants of northern California. The book consists of a total of 261 plant prints and one drawing (of poison oak, to which the authoress states she is allergic) loosely arranged in categories, which include marine algae; fungi, lichens, and mosses; ferns and fern allies; grasses, sedges, and rushes; wild flowers; shrubs; and trees. The placement of the nature prints within these categories is something less than scientific, as is exemplified by the inclusion of a cat-tail (*Typha* sp.) and a bur-reed (*Sparganium* sp.) along with the ferns and fern allies. Each plate is labeled with a common and scientific name, along with a short caption intended to help in positive identification. The idea is that the plant prints are the main aid in identification. Unfortunately, the majority of prints are muddy and unclear, and in most instances one would have to be familiar with the plant in question before it would be recognizable in the nature print. It would seem to me that anyone interested in learning and identifying the more common plants of northern

California would be far ahead to consult one of the several pocket guides that cover the flora of the region, many of which are profusely illustrated with clear color photographs and diagnostic line drawings.

STEPHEN A. SPONGBERG

Intermountain Flora. Vascular Plants of the Intermountain West, U.S.A., Volume 1. Arthur Cronquist, A. H. Holmgren, N. H. Holmgren, J. L. Reveal. New York: The New York Botanical Garden and The Hafner Publishing Company. 1972. 270 pages, illustrated. \$17.50.

This is the first of a projected six-volume flora covering an area which includes all of Utah, most of Nevada, and smaller portions of Arizona, Oregon, Idaho and Wyoming. Somewhat more than half of the present volume is devoted to introductory essays, physiography, plant geography and a most useful biographical section entitled "Botanical Explorations in the Intermountain Regions" (36 pages).

The Flora proper follows the pattern of the New York Botanical Garden floras; large page size, each species illustrated, and ample ecological and other notes at the end of each description. Volume one includes the Ferns, Fern worts, and Gymnosperms (including Ephedra). It looks like an interesting and useful series for anyone interested in the plants of the West.

GORDON P. DEWOLF, JR.

The Time-Life Encyclopedia of Gardening — Landscape Gardening. James Underwood Crockett and the Editors of Time-Life Books. Boston: Little, Brown and Company. 1972. 160 pages, illustrated. \$6.95.

In *Landscape Gardening* we have another beautiful coffee table book that offers a good deal of general information and sets some lovely moods with its flowing text and stunning photographs.

The author provides good introductory comments, some useful guidelines for each topic he chooses to pursue, and the photographs often furnish new ideas of ways to handle problems.

However one is left with a feeling that the essentials, the nitty-gritty stuff that makes *real* landscape gardening, have

been left out. The emphasis here is on the "homeowner", most certainly the suburban clientele at which this series of books is aimed. There is a quotation from Robert Royston which doesn't seem to have influenced Mr. Crockett: ". . . But not everyone can have one-half to three-quarters of an acre to let nature flourish for him alone, there's not that much nature to go around. It stretches our resources too thin . . ."

Now is the time for a book that starts here and faces the needs of a community that is ecologically and sociologically concerned and active. The Time-Life editors should start publishing books with real information for us to put into practice; not picture books that are out of date as they come to the stands.

JACK LINK

Canadensium Plantarum. Jacques Philippe Cornut. New York: Johnson Reprint Corporation. 1966. xxii + [18] + [238] + 2. \$15.00.

This is the era of the reprint book. Contemporary hard-cover titles are reprinted in paper back. Out-of-print titles are reprinted verbatim. Antique books are reprinted with scholarly introductions, explaining their importance and setting them, and their authors, in the proper milieu. Cornut's *Canadensium Plantarum* . . . *Historia* has long been a sort of mythical book, mentioned with bated breath in lectures on the history of botany, or botanical art, as a milestone in human intellectual progress, as the "first North American Flora"; very rarely as containing the "first flora of Paris".

Let there be no mistake, it is good to have a reprint of Cornut at a reasonable price. It is good, too, to have the available information about Cornut brought together and digested. It is unfortunate that the introduction imputes to the plant descriptions and illustrations greater accuracy than actually exists. Many of the illustrations lack sufficient detail to be readily identifiable, and the descriptions are not very helpful. Further, in many cases the nativity of the plant is not given. We may note that Canada, the West Indies, Southern Europe and the Near East, and the Cape of Good Hope, are all represented.

It is unfortunate that the author of the introduction did not consult a botanist or horticulturist before producing his list of "probable modern identifications" of the plants mentioned and/or illustrated. Of the 78 plants cited, 20 were either unidentified, incompletely identified, wrongly identified, or incorrectly named.

Not a very good average. Many of Cornut's names are indexed in Richter, H. E. — *Codex Botanicus Linnaeanus* Leipzig: Otto Wigand. 1840, and some are mentioned in Krause, G. — *Geschichte der Pflanzeneinfuhrungen in die europäischen botanischen gärten* Leipzig: Wilhelm Engelmann. 1894.

- t 9 Thlaspi luteum spanospermon = possibly a European *Epilobium* similar to *E. alpinum*, L. ?
- t 17 De Valeriana = *Epilobium*, if American probably *E. coloratum*, but it could equally well be a European species.
- t 21 Valeriana urticaefolia flore albo = *Eupatorium rugosum*.
- t 32 Polygonatum spicatum sterile = typical form of *Smilacina stellata* (L.) Desfontaines.
- t 34 Polygonatum spicatum fertile = cited by Linnaeus in the original description of *Convallaria* (*Smilacina*) *stellatum*.
- t 39 and 41 Polygonatum ramosum flore luteo maius] *Uvularia perfoliata* or
Polygonatum ramosum flore luteo minus] *U. grandiflora*.
- t 82 Rhamnus myrtifolius ex insula sancti christophori = There has been a mix-up of names between this plate and the next. This plate is *Primula vulgaris* Hudson (*P. acaulis* (L.) Hudson).
- t 84 Carchichec turcarum sive primula veris constantinopolitana = the name refers to the previous plate. This illustration seems to be a sterile twig of a *Cassia*.
- t 95 Ranunculus latifolius multiplex serotinas = a double-flowered form of *Ranunculus bullatus* L. which seems to have been lost to cultivation for more than 200 years.
- t 100 Edera quinquefolia canadensis = *Parthenocissus quinquefolia* (L.) Planch.
- t 124 Scordium spinosum odoratum = *Teucrium spinosum* L.
- t 142 Millefolia tuberosa = *Filipendula hexapetala* Gilib. a common old-fashioned garden perennial native from Scandinavia to Siberia. Not native in North America.
- t 154 Narcissus pumilus indicus polyanthos = *Crinum*, possibly *C. lineare* from South Africa.
- t 158 Narcissus iaponicus rutilo flore = *Nerine sarniensis* (L.) Herb.
- t 163 Plantago maxima hispanica . . . = *Plantago cornuti* Gouan.
- t 165 Sisynrichium indicum = *Spiloxene capensis* (L.) Gar-side (= *Hypoxis stellata* (Thunberg) L.f.).

- t 169 *Solidago maxima americana* = *Solidago sempervirens* L.
- t 187 *Thalictrum canadense* = *Thalictrum cornuti* L. = *T. aquilegifolium* L. var. *typicum* Beck. f. *cornuti* (L.) Boivin a native of Europe.
- t 194 *Bellis Ramosa umbellifera* = *Erigeron annuus* (L.) Persoon.
- t 205 *Calceolus Marianus canadensis* = *Cypripedium reginae* Walt.

GORDON P. DEWOLF, JR.

The Plants of Southern New Jersey. Witmer Stone. Boston, Mass.: Quarterman Publications, Inc. 1973. 828 pages, 128 plates. \$25.00.

Originally published in a limited edition in 1911 as Part II of the Annual Report of the New Jersey State Museum for 1910, entitled "The Plants of Southern New Jersey with Especial Reference to the Flora of the Pine Barrens and the Geographic Distribution of the Species". The Quarterman edition has been enlarged to include a foreword of four pages by Elizabeth M. Woodford.

The pine barren area of New Jersey has long been recognized as a unique vegetational sector comprising some endemic species of plants; some with ranges northward to Newfoundland; some showing affinities on Cape Cod; some with continuous or disjunct ranges southward to the coastal plain of Georgia and Florida. Since Stone's time, new highways have made additional areas readily accessible. A few portions of the area have been established as nature reserves, state parks, or state forests for preservation of the unusual plants and animals. Federal recognition of the sector as a landmark or national park was sought in 1967. Hopefully, this reprinting of Stone's work will give additional impetus to steps toward preservation of the pine barrens and adjacent areas.

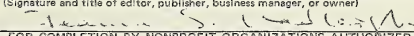
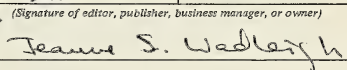
This reprint is well done, and the original illustrations of photographs, line drawings and paintings, not always well printed in the original, have lost but little in the current reproduction. Regrettably, no attempt has been made to bring the nomenclature up to date from that of the American Code used by Stone. The foreword suggests that the correct scientific name can be obtained, via the common name, from Gray's *Manual of Botany*, or Britton and Brown's *Illustrated Flora*. This is misleading since neither reference volume suggested offers syn-

onyms of scientific names, which are necessary to sort out the correct name from the several offered by Stone. Some of the common names used by Stone, checked at random, do not occur in either Gray or Britton and Brown. Reprinting of older and rare volumes is admirable. For some volumes it should be done without changes, but others like this one would be improved by at least an appendix of modern nomenclatural equivalents or the suggestion of references such as Jack McCormick's excellent "Pine Barrens of New Jersey, A Study of Significance", prepared by the Academy of Natural Sciences of Philadelphia in 1967.

RICHARD A. HOWARD



Downy Woodpecker. Photo: R. Weaver.

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Living With Poisonous Plants

The word POISON too often creates fear when it should suggest a warning. Many chemicals or common household substances used incorrectly, usually in the wrong quantity, can cause illness or even death; this is also true with certain plants. Left alone they are harmless. Bruised, crushed, or eaten in varying quantities, they may provoke effects which are upsetting, painful, or even fatal to man.

The plant is the product of a series of chemical reactions. These reactions produce useful materials such as carbohydrates, fats, proteins, enzymes, gums and resins as well as other chemicals which may adversely affect men or animals.

Plant chemicals are known to cause irritating reactions in the human body. Certain chemicals on leaf surfaces or in plant juices may be irritating to the skin, inducing blisters, swelling or reddening. They also sometimes effect chemical changes leading to light sensitivity, discoloration, and in extreme cases, an actual erosion of skin tissues.

Some other plant effects are strictly mechanical. Punctures or tears by spines, thorns, or the small protuberances on microscopic pollen grains may cause irritation, with subsequent swelling. Hypodermic-like hairs of the Stinging Nettle, for example, puncture the skin and forcibly inject a chemical which creates a sensation of violent pain or burning. Latex or milky juices of certain plants coagulating in the throat or drying on the skin produce an uncomfortable tightening sensation that could induce panic in the small child.

In some parts of a plant potentially injurious chemicals accumulate in quantity as storage products. This occurs in seeds or roots and occasionally in leaves. Thus, a small volume of the plant tissue may contain a relatively large amount of toxic material.

Man throughout his years on earth has learned by trial and error which plants threaten his well-being and has passed on this information. However, neither the modern botanist nor the physician can predict the possible human reaction to all plants nor the quantities of reputedly toxic ones necessary to cause illness.

Today there is an urgent need for public information and awareness of potentially hazardous plant materials. Our increased contact with them in and about the home, as well as in the country; the trend to using natural foods, to eating wild plants, to living off the land has led many people to try strange plants as food. Often mistakes have been made in identification, while in other cases plant products have not been prepared properly and illness and poisoning have resulted.

Although adults obviously are vulnerable, our primary concern is the inquisitive child. Relatively small amounts of potentially toxic material are necessary to cause severe or even fatal consequences in a small body, whereas the same volume might have little or no effect on a teenager or adult.

During the Second World War, staff members of the Arnold Arboretum produced survival manuals for the military forces and conducted training programs which led to the establishment of the air-sea rescue services. Special emphasis was placed on the edible and poisonous plants and animals of each area of operation, with simple general rules of safety included. For adults these guidelines are valid today in and around the home as well; however, children should be taught not to put any unknown plant material in their mouths.

Safety Rules

1. Avoid eating all plants that have milky or colored juices: this includes members of the Milkweed, Poison Ivy, Spurge and Poppy families. Needless to say, there are exceptions to all general rules, for the young shoots of the Milkweed plant are edible and even Lettuce has a milky juice.
2. Avoid all unknown white or red fruits. Poison Ivy, Poison Sumac, and some species of Baneberry have white fruits and are poisonous. Strawberries, Apples and Tomatoes are red, but these are known. The majority of unrecognized red fruits are potentially toxic.
3. Avoid eating wild seeds, for the seed of the plant usually has the greatest accumulation of chemical which may be toxic. In general the toxicity of plants is greatest in the storage organs of seeds, fruits, roots and tubers. Young plants or young fruits may be less toxic than the same parts in mature condition. However, some plant poisons are breakdown products, and wilted leaves may often be more dangerous than fresh material.
4. Avoid all fruits which are three-angled or three-lobed and thereby eliminate the potential dangers of the Spurge, Soapberry, Horsechestnut, Amaryllis and Lily families. Some of

the world's most infamous poisonous plants belong to these families.

5. Avoid all bulbs that lack the smell of Onions or Garlic. Some members of the Lily and Amaryllis and related families with basal bulbs may kill you if eaten in quantity.

6. If you must experiment in eating unknown plant materials, it is a rule of safety to cook the plant parts in two changes of water. Then *sample* a small bit before consuming a lot. If the cooked material tastes unpleasant, don't eat it. Your own reaction may be the sensible one. Many plant poisons are water-soluble or destroyed by heat. Cooking and discarding two changes of water lessens the amount of poisonous material or removes it completely.

What To Do If Poisoning Is Suspected

Seek information as soon as possible. Plant poisons may cause an immediate reaction in the human body or may be delayed in their effects for several hours. Residents of cities that have poison centers or large botanical gardens may get information from either source. Look under "Poison" in the emergency pages of your telephone book. Before you call have a piece of the plant in your hand so you can give a description of it. The person answering will ask questions according to the time of the year, for he probably knows what poisonous plants are most conspicuous at each season in woodlands, cultivated out of doors, or in your home. His questions may involve the size of the plant, the presence of spines or thorns, the position of the leaves (opposing each other or alternating on the stem), the color of the fruit, seed or flower, and whether a juice is present or lacking. He will need to know the age or size of the child and how much he may have consumed. If you know a name for the plant, volunteer this information but remember that common names vary with locations. For example "Dog Berry" generally applies to a non-poisonous plant in Massachusetts and to a toxic plant in Maine. Frequently "Mayflower" and "May Apple" are confused (the latter may be poisonous) and "Ivy" can apply to a dozen different plants, some toxic and others harmless.

The doctor or the botanist who answers the call will recommend the action you should take. It is not always desirable or necessary to have the child vomit; when it is advised, don't hesitate. The direction will generally be to administer one tablespoon of Ipecac syrup for children over one year. This is an emetic which can be purchased without prescription in one

ounce quantities at drug stores and should be on hand for emergencies in every home with small children. If vomiting is not induced within fifteen minutes, a second dose of one tablespoon may be given; then notify your physician. If vomiting still does not occur, take the child to the emergency room of a hospital. In serious cases a doctor may wish to use special methods to clean out the stomach, or to keep the child under observation. Sometimes the irritating or potentially poisonous material would be spread if vomiting occurred. In such cases Ipecac syrup is not recommended, and the alternative suggestion is to dilute the substance by feeding the child. Some materials such as the latex of Spurges are best treated by feeding dry crackers or bread. In other instances involving plant oils, the recommendation may be for large amounts of peanut butter and jelly, cereal, or even ice cream.

This is a guide to the most common plants of woodlands, gardens, and homes which are potentially dangerous if misused. It is based on the collaboration of medical consultants and the staff of the Arnold Arboretum experienced in answering questions from residents of the northeastern states referred to us by the Boston Poison Information Center.

Obviously, not all potentially poisonous plants from this area or others can be included. We have omitted mushrooms, toadstools and fungi because there are poisonous mushrooms which are very difficult to identify. Always call the poison center for suspected cases of mushroom poisoning and carefully follow the advice of the specialist.

Comprehensive reference volumes are available for the person who wishes larger lists of edible or potentially toxic plants; such references form the bibliography of this guide.

As a service to the community at large, the Arnold Arboretum has just produced a 26-minute, color and sound educational movie on 78 poisonous plants. The film may be borrowed by groups wishing to show it for educational purposes. Reservations should be requested well in advance by writing to the Arnold Arboretum, Jamaica Plain, Mass. 02130.

RICHARD A. HOWARD

Abrus precatorius — Jequirity Pea, Precatory Bean



POISONOUS PARTS — The red and black seeds which contain a toxin, abrin, similar to snake venom. It begins to act in 12-72 hours.

SYMPTOMS — Vomiting, diarrhea, drowsiness, weakness, weak and fast pulse, circulatory collapse, coma and death.

The seed coat must be cracked before danger occurs; intact seeds will pass harmlessly through the digestive tract. However, a single damaged seed may be sufficient to kill a child.

Seeds of *Abrus* are frequently used in jewelry, dolls and other souvenirs of the tropics.

Aconitum spp. — Monkshood

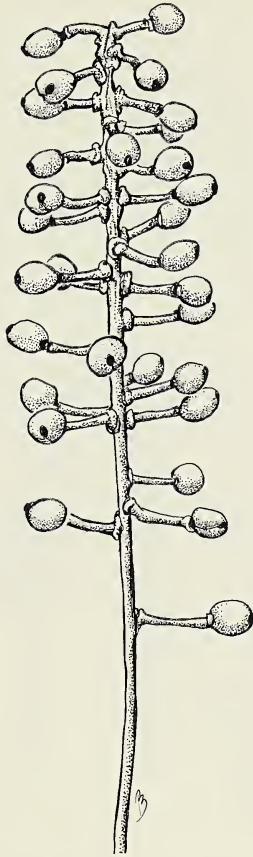


POISONOUS PARTS — All parts contain a number of poisonous substances. The roots are particularly virulent.

SYMPTOMS — Tingling of the tissues of the mouth followed by numbness; a sensation of warmth in the stomach; nausea, frequently without vomiting; slowing of the pulse and respiration. Death may follow within a few hours of ingestion.

Monkshood is an ornamental garden perennial growing to 3 feet; its blossoms are deep blue or purple, and occasionally yellow or white. The common name aptly describes the blossom form.

Actaea spp. — Baneberry



POISONOUS PARTS — The roots and berries are the most poisonous parts.

SYMPTOMS — Severe stomach cramps, vomiting and diarrhea.

Baneberry is a perennial herb sometimes cultivated in the garden; when in fruit it is conspicuous in the woods.

All species are poisonous.

Arisaema triphyllum — Jack-in-the-Pulpit



POISONOUS PARTS — All parts contain needle-like crystals of calcium oxalate, as well as other chemicals.

SYMPTOMS — An intensely painful burning sensation in the mouth and throat, accompanied by swelling of the soft tissue in these areas; vomiting and diarrhea sometimes occur. Death may result from blockage of the windpipe due to swelling of the surrounding tissues.

Jack-in-the-Pulpit is a common plant in partly shaded, wet woods. The clusters of red fruits are conspicuous in the fall. Children sometimes eat the swollen underground base or the fruits.

Buxus spp. — Box, Boxwood



POISONOUS PARTS — The leaves and twigs contain a number of poisonous substances, including buxene.

SYMPTOMS — Stomach pains, diarrhea, vomiting, convulsion; and in extreme cases, death.

Box is commonly used as an evergreen hedging or edging plant in gardens from Boston southward.

All species are poisonous.

Caladium spp.



POISONOUS PARTS — All parts contain needle-like crystals of calcium oxalate, as well as other chemicals.

SYMPTOMS — An intensely painful burning sensation in the mouth and throat, accompanied by swelling of the soft tissue in these areas; vomiting and diarrhea sometimes occur. Death may result from blockage of the windpipe due to swelling of the surrounding tissues.

Caladiums are plants commonly grown in summer for their colorful, variegated leaves. They also are sometimes used as house plants.

All species are poisonous.

Caltha palustris — Marsh Marigold



POISONOUS PARTS — All parts contain a volatile oily substance called protoanemonin, which acts as an irritant to the skin or mucous membranes. In addition, several alkaloids may be involved.

SYMPTOMS — Irritation and inflammation of the soft tissue of the mouth, salivation, abdominal pain and diarrhea. Symptoms of alkaloid poisoning, such as nervousness and depression, also may occur.

Common to marshes and wet areas, Marsh Marigold is conspicuous in early spring for its showy, yellow flowers.

Cannabis sativa — Hemp, Marijuana



POISONOUS PARTS — The plants produce a resinous substance with narcotic properties.

SYMPTOMS — Exhilaration, delusion, blurred vision, loss of coordination, drowsiness and coma result from any form of ingestion.

Marijuana is found as a weed in waste ground.

Federal and state laws presently regulate the possession of Cannabis in any form.

Celastrus spp. — Bittersweet



POISONOUS PARTS — Leaves, bark and the attractive fruits with contrasting color of seeds and flesh.

SYMPTOMS — Vomiting, diarrhea, convulsions, chills and coma.

Bittersweet is a native, woody, deciduous vine often encountered wild as well as in cultivation. Its showy fruits are commonly collected in the fall for dried arrangements which should not be accessible to small children.

All species are poisonous.

Cicuta maculata — Water Hemlock

POISONOUS PARTS — All parts, particularly the roots, contain a yellowish viscid fluid or resinous solid called cicutoxin.

SYMPTOMS — Occur within 15-45 minutes, beginning with excessive salivation, then tremors of the limbs and sudden and violent convulsions. Unconsciousness and death follow.

Water Hemlock may be a weed of hedgerows, ditches, or field margins. It is readily recognized by its clusters of thickened roots, the series of diaphragms of the pith at the base of the stem, and drops of yellow, oily fluid which secrete on surfaces of cut tissue.

Colchicum autumnale — Autumn Crocus



POISONOUS PARTS — All parts of the plant are equally and intensely poisonous.

SYMPTOMS — Burning pain in the mouth, intestinal pain, vomiting, diarrhea, reduced pulse, coldness of the extremities and prostration.

Autumn Crocus is commonly grown for its showy lavender flowers appearing without leaves in the fall. It is advertised for forcing to bloom without soil or water on a windowsill and thus is an object of curiosity to a small child.

Conium maculatum — Poison Hemlock

POISONOUS PARTS — All parts contain a poisonous volatile oil called coniine.

SYMPTOMS — Occur within 15-45 minutes. Muscular weakness, dizziness, disordered vision, loss of muscular control and sensation in the extremities.

Poison Hemlock is a fairly common weed of hedges, ditches and waste land. The plant bears a resemblance to Queen Anne's Lace or Wild Carrot in its white flowers, but is smooth throughout, not hairy. It has an unpleasant odor variously described as "mousey" or like cat urine; its taste also is offensive.

Convallaria majalis — Lily-of-the-Valley



POISONOUS PARTS — All parts (leaves, flowers, berries, and underground portions) contain a poisonous substance called convallarin.

SYMPTOMS — The pulse and heart beat are slowed; vomiting and diarrhea may occur.

Lily-of-the-Valley is a common garden perennial or ground cover grown for its sweet-scented white flowers in spring. The red berries in late summer and fall are attractive to small children.

Daphne mezereum — Daphne



POISONOUS PARTS — All parts are highly toxic.

SYMPTOMS — Skin blisters from the juice; blisters of the soft tissues of the mouth from plant portions chewed and/or swallowed. Vomiting and diarrhea, with blood or mucus are common.

Two or three fruits may contain enough of the acrid juice to be fatal to a child.

Daphne is a shrub commonly grown for its fragrant lilac-pink flowers in early spring. The white, or red fruits are attractive to children.

Daphne cneorum, Rose Daphne, with spreading stems, ever-green leaves, and clusters of pink flowers in spring is equally injurious.

Datura spp. —
Jimson Weed, Thorn Apple, Angel's Trumpet



POISONOUS PARTS — All parts contain several alkaloids which act on the human system. Approximately an ounce of any plant part constitutes the lethal dose for a child. Dust from seed pods causes what is called “corn picker’s eye”, a persistent dilation of the pupils.

SYMPTOMS — Intense thirst and disturbance of vision; rapid pulse and high blood pressure; delirium, violence, convulsion, coma, death.

Jimson Weed, *Datura stramonium*, is a common weed in rich soils around manure piles, animal enclosures, and the like. Several other species with large, white, trumpet-shaped flowers are cultivated in gardens for ornament and also are poisonous.

Delphinium spp. — Delphinium, Larkspur



POISONOUS PARTS — Seeds and young plants contain substantial quantities of several harmful alkaloids.

SYMPTOMS — Salivation, vomiting, diarrhea, convulsion, coma.

Delphinium and Larkspur are commonly cultivated, usually blue-flowered annuals or short-lived garden perennials. Mature plants and flowers are less toxic than the young plants and seeds.

All species are poisonous.

Dieffenbachia spp. — Dumb Cane



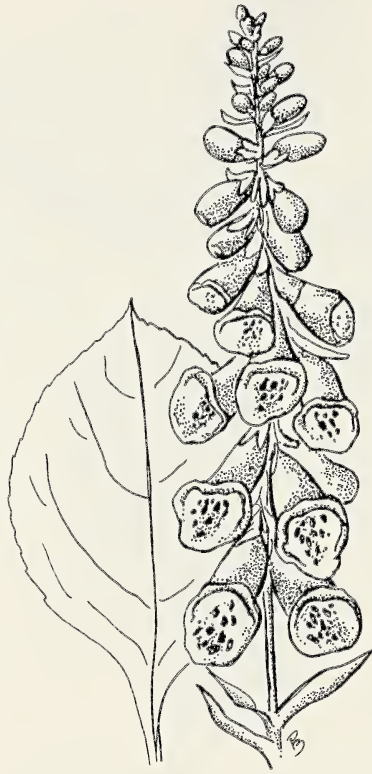
POISONOUS PARTS — All parts contain needle-like crystals of calcium oxalate, as well as other chemicals.

SYMPTOMS — An intensely painful burning sensation in the mouth and throat, accompanied by swelling of the soft tissue in these areas. Vomiting and diarrhea also may occur. Death may result from blockage of the windpipe due to swelling of the surrounding tissue.

Commonly cultivated house plants often with variegated leaves, *Dieffenbachias* are recommended for areas of low light intensity. They should be kept out of the reach of small children.

All species are poisonous.

Digitalis purpurea — Foxglove

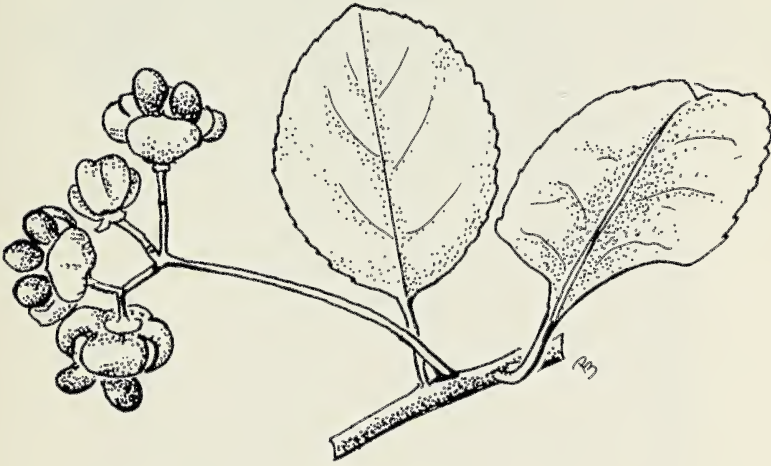


POISONOUS PARTS — All parts (including the seeds) contain a number of harmful substances.

SYMPTOMS — Nausea and vomiting and a very slow pulse, followed somewhat later by rapid and/or erratic heart beat.

Foxglove is a common garden biennial or short-lived perennial. Children sometimes pick the drooping tubular flowers and suck the nectar from their base. This is a practice which should be discouraged.

Euonymus spp. —
Burning Bush, Spindle Tree, Wahoo



POISONOUS PARTS — Leaves, bark and the attractive fruits with contrasting color of seeds and flesh.

SYMPTOMS — Vomiting, diarrhea, convulsions, chills and coma.

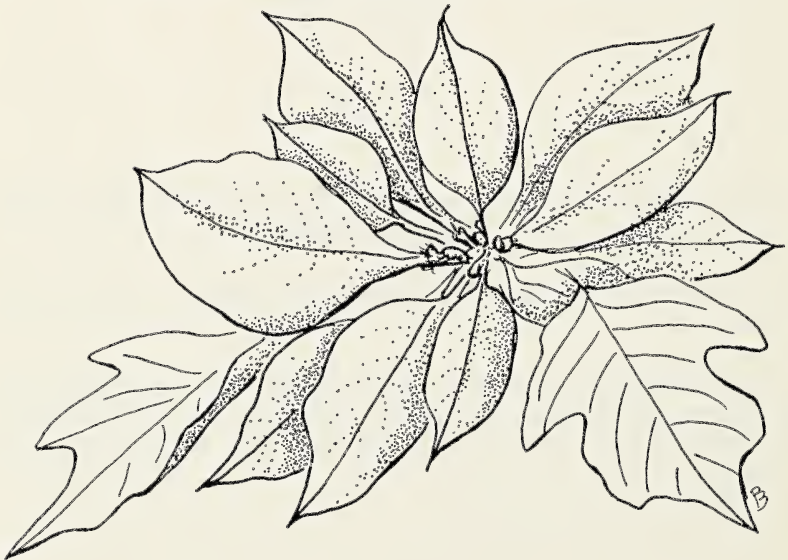
Euonymus are shrubs or evergreen vines; their fruits are frequently collected in the fall and used for dried arrangements. Such arrangements should be kept out of the reach of small children.

All species are poisonous.

Euphorbia marginata — Snow-on-the-Mountain



Euphorbia pulcherrima — Poinsettia



Euphorbia milii — Crown of Thorns



POISONOUS PARTS — All parts contain a milky juice composed of substances which may cause mild to severe dermatitis.

SYMPTOMS — Rash or blistering of the skin; severe irritation of the mouth, throat, and stomach; vomiting and diarrhea.

Snow-on-the-Mountain is cultivated in the garden as a hardy annual. The leaves are commonly variegated or white on the margins.

Although the florist's Poinsettia is probably one of the least noxious Euphorbias, its seasonal abundance and availability in the home make it important. It should be placed where small children cannot reach it.

Crown of Thorns is a spiny house plant bearing clusters of red flowers.

Hedera helix — English Ivy, Baltic Ivy



POISONOUS PARTS — The leaves and berries contain a substance which may cause poisoning.

SYMPTOMS — Excitement, labored breathing, diarrhea, and coma.

English Ivy has numerous forms, some hardy and used as ground covers, or to climb on brick walls; others, not hardy, are grown as house plants.

Ilex spp. — Holly



POISONOUS PARTS — Leaves and berries contain a bitter substance.

SYMPTOMS — Vomiting and diarrhea; stupor.

Berried sprigs of Holly are commonly used as household decorations during the Christmas season. As they dry, the leaf and berry stalks become very brittle, shedding freely. Great care should be taken that small children do not eat the tempting berries.

Hollies are woody shrubs or trees, evergreen or deciduous, which are cultivated for their berries, and for general landscape purposes.

All species are poisonous.

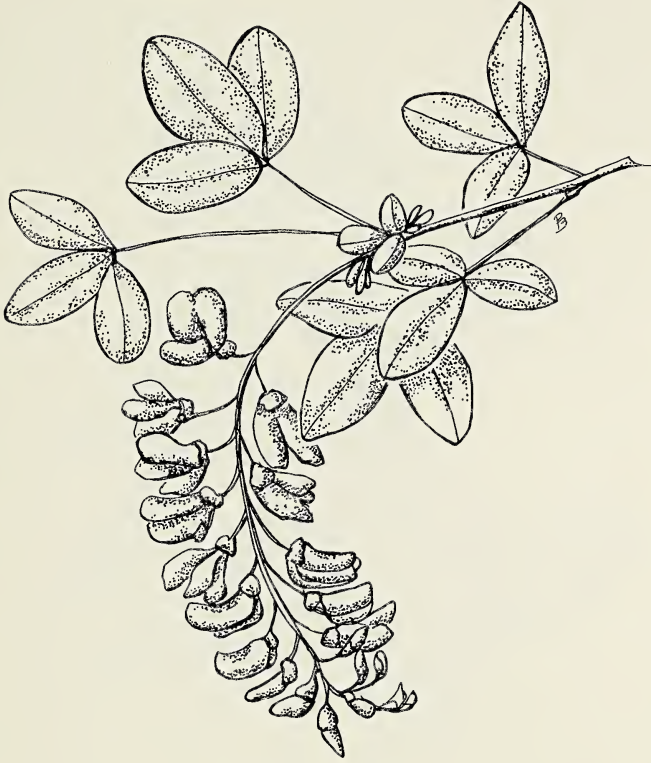
Kalmia latifolia — Mountain Laurel

POISONOUS PARTS — All parts, including the flowers, are poisonous.

SYMPTOMS — Salivation, vomiting, staggering walk, convulsions, difficult breathing, paralysis.

Mountain Laurel is a popular cultivated evergreen shrub bearing large clusters of white and pink blossoms in spring. *K. angustifolia* and *K. polifolia*, Lambkill and Bog Laurel, respectively, are common in the wild in New England and also are potentially toxic. Children have been poisoned by sucking on the flowers to obtain nectar "honey" or by making a play "tea" from the leaves.

Laburnum spp. — Golden Chain Tree



POISONOUS PARTS — All parts, but particularly the flowers and seeds, contain a substance called cystine.

SYMPTOMS — Vomiting, convulsions; in severe cases, death.

A member of the Pea family, this as all others should be regarded with suspicion. While garden beans and peas are wholesome and nutritious, the seeds and/or foliage of many such as Precatory Bean, Wisteria, Lupine, and Loco Weeds are definitely injurious or cause fatality.

The Laburnum is a showy shrub or small tree. Its clusters of pendant, yellow flowers have prompted its popular name.

All species are poisonous.

Lantana camara — Lantana



POISONOUS PARTS — Leaves and fruits. The green, unripened fruit is most virulent.

SYMPTOMS — Vomiting and diarrhea, muscular weakness, collapse.

Lantana is a tropical shrub commonly cultivated in the house and out-of-doors. In the north, berries are not usually produced in the house, but outside in summer they may be plentiful. Children should be discouraged from eating them.

Ligustrum spp. — Privet



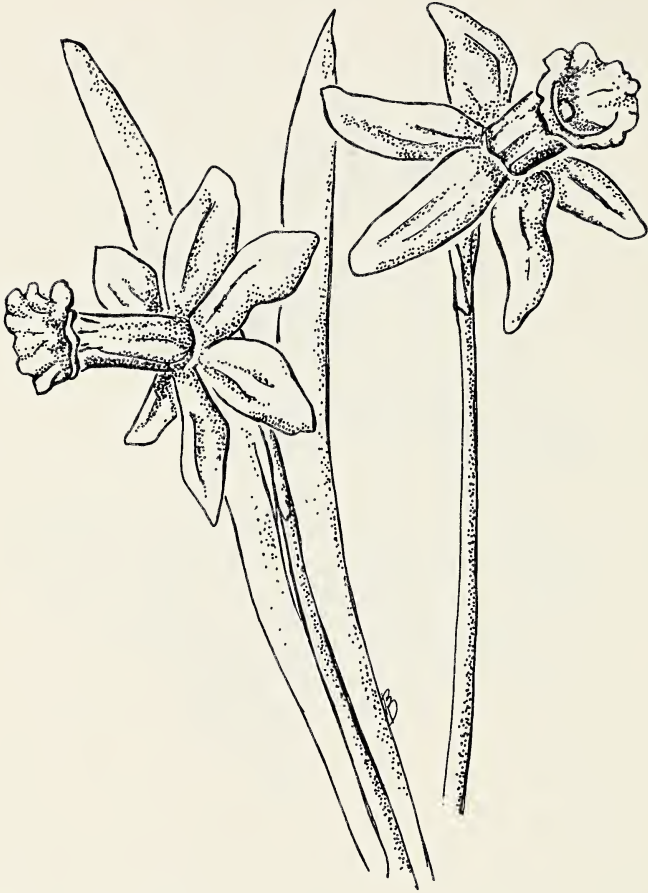
POISONOUS PARTS — Leaves and berries may cause problems.

SYMPTOMS — Vomiting and diarrhea.

Privet is a common shrub used for hedges. Clippings should not be left lying on the ground and children should be discouraged from putting either the leaves or the fruits in their mouths.

All species are poisonous.

Narcissus spp. — Daffodil



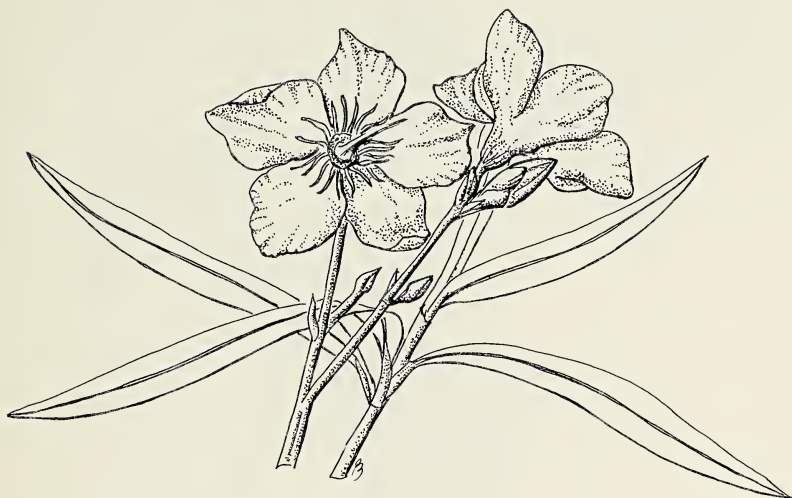
POISONOUS PARTS — All parts contain active principles.

SYMPTOMS — Vomiting, diarrhea, trembling, convulsions.

Daffodils are bulbous plants widely cultivated for their yellow flowers in early spring. The juice of the leaves and flower stalks also may cause a dermatitis.

All species are poisonous.

Nerium oleander — Oleander



POISONOUS PARTS — All parts are toxic. A single leaf is potentially a lethal dose for an adult.

SYMPTOMS — Nausea, vomiting, stomach pain, weakness, abnormal heart beat, and coma, usually beginning several hours after ingestion. Death may follow within 24 hours.

Oleander is a shrub commonly cultivated in warm temperate regions for its flowers. It is occasionally grown as a large house plant in the north.

Philodendron spp.



POISONOUS PARTS — All parts contain needle-like crystals of calcium oxalate, as well as other chemicals.

SYMPTOMS — An intensely painful burning sensation in the mouth and throat, accompanied by swelling of the soft tissues in this area. Vomiting and diarrhea also may occur. Death may result from blockage of the windpipe due to swelling of the surrounding tissues.

Philodendrons, both the climbing and rosette forms, are commonly used in the home and in public buildings to produce an “exotic” effect in areas of low light intensity. In the home, at least, they should be placed out of reach of small children and pets.

All species are poisonous.

Phoradendron serotinum — Mistletoe



POISONOUS PARTS — The white berries are particularly toxic.

SYMPTOMS — Vomiting, diarrhea, convulsions, coma.

Sprigs of Mistletoe are used for Christmas decoration. As they dry, the stalks of berries and leaves become brittle and shed readily. They should be placed so that small children cannot obtain the detached berries.

Phytolacca americana — Pokeberry



POISONOUS PARTS — All parts are poisonous.

SYMPTOMS — Burning sensation in the mouth. In one to two hours, stomach cramps, vomiting, diarrhea, prostration, salivation, dimness of vision, and convulsions.

A common herbaceous weed in disturbed areas, Pokeberry may grow to 8 feet in height.

The young shoots (6-12 inches long) when boiled in two changes of water are considered good greens for the table. The berries are attractive to children because of the "squashy" consistency and deep purple stain. However, three or four berries may sicken a child and ten can seriously affect an adult. Allegedly, they are edible when cooked.

Prunus virginiana — Chokecherry



POISONOUS PARTS — All parts contain a substance which can be converted to hydrocyanic acid. Particularly dangerous are the bark and wilted leaves.

SYMPTOMS — Difficulty in breathing, paralysis, prostration, convulsions, coma, and death.

Since the wilted leaves are most dangerous, broken and pruned branches and twigs should be gathered and disposed of. The flesh of the fruit is safe (though "puckery"); the kernels of the seeds should be avoided.

Chokecherries, weedy trees growing to 10 feet, usually are found along roadsides and in disturbed areas; they sometimes are cultivated.

Ranunculus spp. — Buttercup

POISONOUS PARTS — Stems and leaves contain a number of substances which may irritate the mouth and stomach. The juice also may blister the skin of sensitive persons.

SYMPTOMS — Irritation of mouth and throat, excessive salivation, colic, diarrhea, depression, slow pulse.

Buttercup is an herb, usually bearing bright yellow flowers, which is most common in wet meadows. The leaves may be mottled with silver and usually are much dissected.

All species are poisonous.

Rheum rhaponticum — Rhubarb

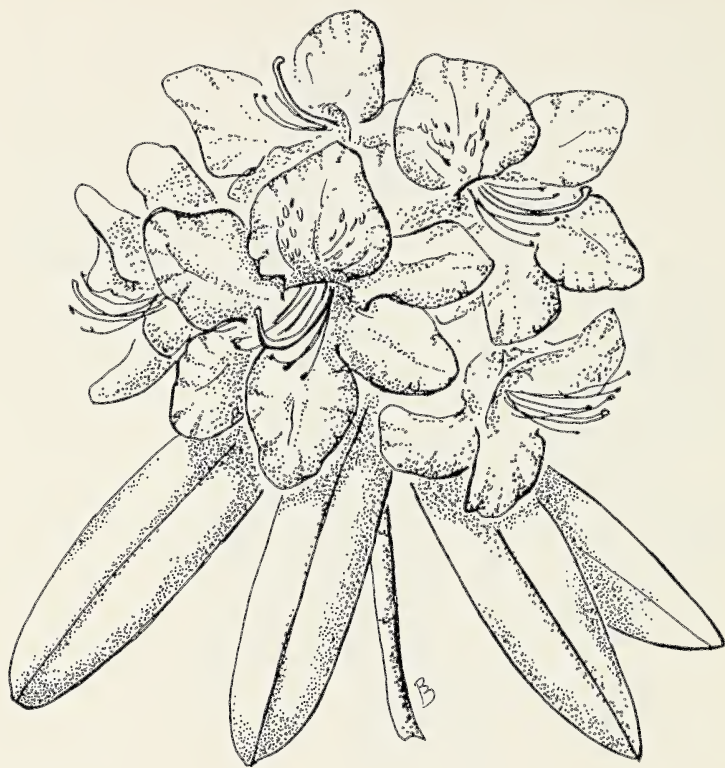


POISONOUS PARTS — The green, expanded, leaf blade contains calcium oxalate.

SYMPTOMS — Stomach pain, vomiting, weakness, coma and death result from large amounts. Muscular weakness and twitching, slowed respiration, weak pulse, coma, and death occur from small amounts.

Rhubarb is a commonly cultivated vegetable. Leaf blades must not be eaten either raw or cooked under any circumstances.

Rhododendron spp. — Rhododendron, Azalea



POISONOUS PARTS — All parts, including the flowers, are poisonous.

SYMPTOMS — Salivation, vomiting, staggering walk, convulsions, difficulty in breathing; collapse.

Rhododendrons and azaleas are commonly cultivated shrubs. Children may be poisoned by sucking the flowers to obtain nectar ("honey") or by making a play "tea" from the leaves.

All species are poisonous.

Rhus radicans — Poison Ivy



POISONOUS PARTS — All parts contain a sap containing a chemical which may cause allergic dermatitis; the irritant also is carried by smoke.

SYMPTOMS — Itching, redness of the skin, small blisters. In severe cases the blisters may become quite large and local swelling of the flesh may occur.

If the sap is removed immediately from the skin by washing with strong soap, the dermatitis may be prevented or at least reduced.

Poison Ivy is a woody shrub or vine with changeable appearance; it is harmful at all seasons, and should never be placed in the mouth.

Poison Sumac (*Rhus vernix*) grows in wet areas and bears greenish flowers and white fruit. It should not be confused with other plants called Sumac which have red fruit and are harmless.

Poisonous species of *Rhus* also are known as *Toxicodendron*.

Ricinus communis — Castor Bean

POISONOUS PARTS — Although all parts are poisonous, the seeds are the most toxic.

SYMPTOMS — Burning sensation in the mouth and throat, vomiting, stomach pains, prostration, convulsions and death.

Ricin, the poisonous principle, is one of the most toxic of plant poisons. One to three seeds are sufficient to kill a child, four to eight will kill an adult.

Castor Bean is an annual plant cultivated for its large leaves and spiny, often colorful seed pods. It may be grown safely if the flower clusters are removed. Do not allow children access to packets containing the seeds.

Robinia pseudoacacia — Black Locust



POISONOUS PARTS — Young leaves, seeds and the inner bark.

SYMPTOMS — Flushed face, vomiting, diarrhea, reduced heart action, coldness of legs and arms, stupor.

Black Locust is a large tree, sometimes cultivated, and sometimes found growing wild in dry wooded areas and along roadsides. It bears pendant clusters of white flowers. Children may be poisoned by sucking the flowers or by chewing twigs.

Sanguinaria canadensis — Bloodroot

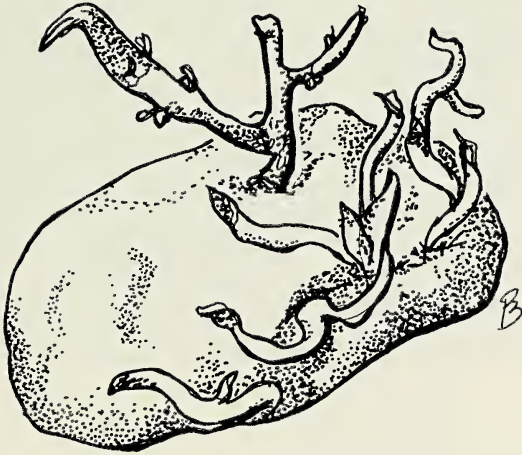


POISONOUS PARTS — All parts are poisonous.

SYMPTOMS — Burning sensation, vomiting, thirst, dizziness, prostration.

Bloodroot is frequently cultivated for its white flowers which precede the leaves in early spring; in the wild it appears in rich woodlands. The blood red sap is a conspicuous feature of its leaves, stems, and roots when broken.

Solanum tuberosum — Potato



POISONOUS PARTS — Unripe tubers which have turned green from exposure to light; “sprouts” from the tubers.

SYMPTOMS — Headache, colic, vomiting, diarrhea; pupils of the eyes may or may not be dilated; mental confusion, stupification, coma.

Except for known edible fruits or tubers, all parts of all members of the Potato family should be regarded with suspicion.

Solanum pseudocapsicum — Jerusalem Cherry



Solanum nigrum — Black Nightshade



Solanum dulcamara — Deadly Nightshade



POISONOUS PARTS — All parts are potentially dangerous but the unripe fruits are most toxic.

SYMPTOMS — Headache, colic, vomiting, diarrhea; pupils of the eyes may or may not be dilated; mental confusion; stupification; coma.

The Jerusalem Cherry is a favorite holiday plant with fruits resembling cherry tomatoes.

Black Nightshade is a weedy annual with small white flowers and shiny black berries.

Deadly Nightshade is a sprawling shrub or herbaceous vine simultaneously bearing small purplish flowers and red berries.

These, like all other members of the Potato family, should be regarded with suspicion unless known to be edible.

Taxus spp. — Yew



POISONOUS PARTS — All parts except the fleshy red covering around the seed.

SYMPTOMS — Vomiting and diarrhea, trembling, difficult breathing, weakness, convulsion, coma, death.

Yew is a commonly cultivated evergreen used for hedges and plantings. The foliage is poisonous; therefore hedge clippings should be gathered and disposed of. Because of the potential toxicity of the seed, children should not be encouraged to eat the red, fleshy covering.

All species are poisonous.

Urtica dioica — Nettle



POISONOUS PARTS — Stinging hairs on leaves and stems.

SYMPTOMS — Rash on the skin.

Nettle is a weedy herbaceous perennial found in rich soil, along roadsides, and in waste places.

Veratrum viride — False Hellebore

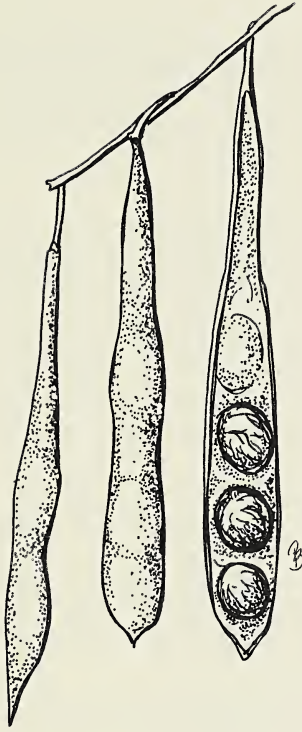


POISONOUS PARTS — All parts are poisonous.

SYMPTOMS — Burning sensation in the mouth and throat; salivation; prostration; shortness of breath; slowed heart-beat and lowered blood pressure.

A coarse herb, 3-8 feet tall, commonly found in wet areas. The large basal leaves may resemble those of Skunk Cabbage.

Wisteria spp.



POISONOUS PARTS — Seed pods and seeds.

SYMPTOMS — Stomach pain, vomiting and diarrhea.

Wisteria is a woody vine commonly grown for its pendant clusters of flowers in the spring.

This, like all other members of the Pea family, should be regarded with suspicion. While garden beans and peas are wholesome and nutritious, the seeds and/or foliage of many others such as Precatory Bean, Lupine, and Loco Weeds are definitely injurious or fatal.

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This selected list of references includes those most readily available which are concerned with humans. Many others not listed deal almost exclusively with animals from the veterinarian's point of view. Those starred (*) probably are the best investments.

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Poison Control Centers

The following cities in Massachusetts maintain an answering service which provides poison information without charge. Emergency service at these centers is available to everyone 24 hours a day, 7 days a week.

BOSTON

Poison Information Center	Area Code 617
Dr. Joel P. Alpert, Exec. Sec.	232-2120
Children's Medical Center	
30 Longwood Avenue (Zip) 02115	

FALL RIVER

Poison Control Center	Area Code 617
Union Hospital	674-5789
300 Hanover Street (Zip) 02720	

NEW BEDFORD

Poison Control Center	Area Code 617
St. Luke's Hospital	997-1515
101 Page Street (Zip) 02740	Ex 311

SPRINGFIELD

Poison Control Center	Area Code 413
Mercy Hospital	788-7321
233 Carew Street (Zip) 01104	Ex 229

Poison Control Center	Area Code 413
Springfield Hospital	788-4581
759 Chestnut Street (Zip) 01107	Ex 704 or 705

Poison Control Center	Area Code 413
Wesson Memorial Hospital	787-2500
140 High Street (Zip) 01105	

WORCESTER

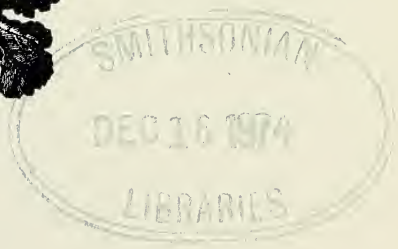
Poison Control Center	Area Code 617
Worcester City Hospital	799-7094
71 Jacques Street (Zip) 01603	

Your Physician: Dr. _____

Phone: _____

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ARNOLDIA

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Cover: *Pelargonium quercifolium*. From *Geraniologia* by C. L. L'Heritier
de Brutelle. Paris, 1787-1788.

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Aromatic Pelargoniums

Introduction. In recent years the culture of horticultural plants has become increasingly popular. This trend prevails especially among city dwellers who perhaps have suddenly become conscious of the sterility of asphalt and concrete.

One of the flowers that is in increasing prominence is the geranium. Traditionally grown for Memorial Day decorations, the sturdy plants with their large clusters of flowers in shades of red and pink are now used in great numbers in parks, along streets and on corners of houses in some of the more venerable quarters of older cities.

The geranium with which we all are familiar is the zonal pelargonium, *Pelargonium hortorum*. There are, however, many other species in the genus. They are grouped into several types: the ivy-leaved, the regals, the uniques, and the scented-leaved. Each of these deserves to be popular on its own and was well-known in the gardens of our grandparents.

This paper is an introduction to scented-leaved pelargoniums.¹ In essence it will have to be a defense of pleasant scents. Pleasant smelling substances were once utilitarian, being used to hide objectionable odors; today, however, soap and public hygiene have successfully removed many of the noxious odors of the past.

The perfumes, however, are still with us, now justified either as a custom or a pleantry. Many perfume substances today are synthetic and are presented in even more artificial manner. Perhaps because of the crass commercialization of scents and the indiscriminate juxtaposition of scent and object, it seems refreshing to be able to smell a scent exuding from its natural source. This is the joy of carnations, cedar panelling, and scented-leaved pelargoniums.

The last have odors that variously evoke descriptions of rose, lemon, nutmeg, almond, peppermint, lime, coconut, apricot, strawberry, ginger, pine or camphor. The varieties all have attractive foliage and, although most have small flowers, they

¹ The terms geranium and pelargonium are often used interchangeably, but as *Pelargonium* is the proper generic name, I shall try to adhere to it.

are delicate and beautifully colored. Of the approximately 250 varieties known, about 75 are available to the home gardener. They are easy to culture, do well as house plants, and as Clifford (1970) so succinctly put it, "they are ideal for those whom the current time-saving techniques have left no time for anything".

From the expert gardener or the would-be-grower of something green, the group deserves attention.

Pelargonium Botany. The family Geraniaceae contains three genera: *Geranium*, *Erodium*, and *Pelargonium*. The names, derived from the three Greek words meaning crane, heron and stork, refer to the resemblance of the seed case to the slender bills of these three birds.

Geranium and *Erodium* both have regular flowers; that is, the petals (and sepals) all are of equal size and shape. In *Pelargonium* the flower is zygomorphic (Gr. zygos = yoke); in other words, the petals (and sepals) are of different sizes and so arranged that in only one place can a line be drawn to separate the flower into equal halves. *Geranium* and *Erodium* are easily separated. All ten stamens are fertile and bear anthers in *Geranium*; in *Erodium*, some of the stamens do not bear anthers.

Members of the genus *pelargonium* while exhibiting wide variations in plant and flower habit all are characterized, in addition to the beak-like fruit of the family, by a nectar tube. This distinctive feature of the *pelargoniums* is a tube that runs from the uppermost sepal along the flower pedicel and is attached to it. Although it varies in length, its location usually can be observed externally by a bend in the pedicel occurring at the end of the tube.

The *pelargoniums* are mostly restricted to South Africa. There are however several from Abyssinia, Kenya and Tanganyika, four from Australia, and one each from Asia Minor, Madagascar, St. Helena, Tristan da Cunha and New Zealand (Clifford 1970). Their usual habitat is desert-like, arid, stony and frost free.

Early History of Pelargoniums. The first record of a *pelargonium* in cultivation appeared in 1633. In his edition of Gerard's "Herbal . . .", Thomas Johnson noted that Tradescant had flowered "*Geranium indicum nocte odoratum*" the preceding year. Later, in 1668, the plant was listed in the catalog of the Botanic Garden at the University of Leyden.

Where Tradescant obtained his specimen is a mystery. Presumably it came from some British ship that had stopped at

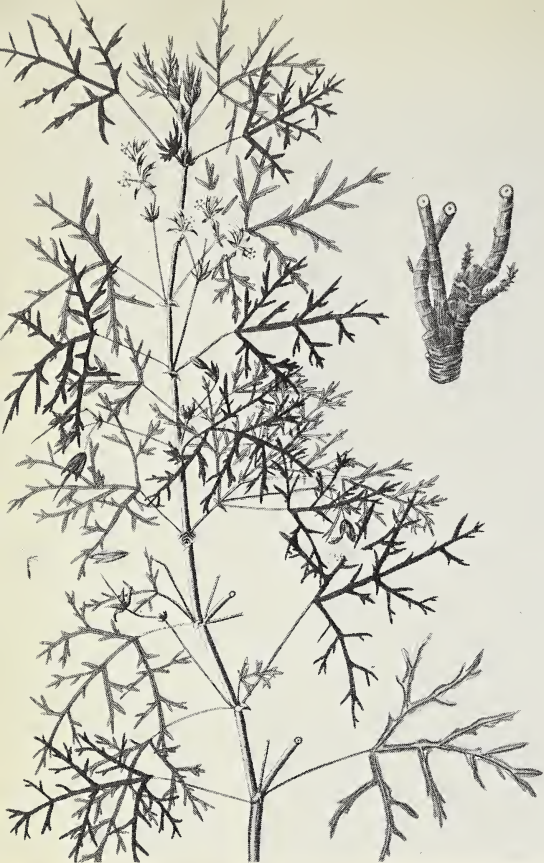


Pelargonium triste. From *Canadensium Plantarum* . . . by J. P. Cornut. Paris, 1635.

Table Bay, the harbor of Cape Town, South Africa; the plant, *Pelargonium triste*, is common in the wild around Cape Town, and the harbor had been in intermittent use by the British, Dutch, and Portuguese ever since its discovery by the last in 1487.

It was not until the last quarter of the 17th century that collections of living plants were sent back to Holland in any quantity. In 1668, the printed catalogue of the plants growing in the Botanic Garden at Leyden listed only 1821 species; in 1687, the number of names had risen to 3029. In particular, in comparison to the one species of *Pelargonium* listed in 1668, ten pelargoniums were growing in the garden in 1686. From this time forward pelargoniums were to be important members of the European garden flora.

In 1724 some eight new species were recorded in cultivation for the first time in the Chelsea Physic Garden. Included among these plants were *Pelargonium odoratissimum*, the apple or nutmeg-scented geranium, and *Pelargonium vitifolium*, the balm-scented geranium. Who brought these to England, and when, is not recorded.



Pelargonium radens. From
Icones Plantarum Rariorum
 by N. J. Jacquin.
 Vienna, 1781–1793.



Above: Pelargonium graveolens



Left: Pelargonium crispum

Both from Geraniologia by
C. L. L'Heritier de Brutelle.
Paris, 1787–1788.

No more scented-leaved species appear to have been imported into England until Francis Masson was sent out from Kew to South Africa in 1771 or 1772. Masson spent five or six years there and travelled extensively. During this period he sent back to Kew the rose-scented *Pelargonium radens* (incorrectly called *P. radula*), *Pelargonium quercifolium*, and *Pelargonium graveolens*, as well as the lemon-scented *Pelargonium crispum*. Masson left South Africa in 1776, later returning. It may have been he who sent the peppermint-scented geranium *Pelargonium tomentosum* which appeared in England sometime before 1790.

Pelargoniums flower abundantly in the northern hemisphere summer. Hybridizing with ease, they are readily raised from seed. Once a collection of species has been gotten together, and the bees allowed to go about their business, the resultant seed will yield a myriad of hybrid forms. This is precisely what happened in the gardens and conservatories of Europe between 1750 and 1850. A multiplicity of forms appeared; some to survive for years, other to disappear quickly. There also arose a multiplicity of names, and the connections between names and plants was sometimes highly tenuous.

Between 1787 and 1838 seven monographic works were published in an attempt to keep up with the bewildering hordes of seedling pelargoniums. Different names were applied by different authors to the same plant, and identical names were applied by different authors to different plants. Hybrid seedlings were grown under the same names as their maternal parents. The resultant confusion still persists. For example: in some cases the plant which is called *Pelargonium* 'Attar of Roses' seems to be, instead, the old species *Pelargonium capitatum*; while the plant which is grown as *Pelargonium capitatum* is really a hybrid between *Pelargonium graveolens* and *Pelargonium radens* which is properly called *Pelargonium X asperum*. Likewise, at least some plants grown as *Pelargonium odoratissimum* are probably hybrid seedlings of that species with *Pelargonium exstipulatum* and should be properly called *Pelargonium X fragrans*. The clue is that true *Pelargonium odoratissimum* does not have lobed leaves.

Some relief may come from genetic studies of the genus. M. G. Daker (1969) has done chromosome counts of several pelargonium species and cultivars. He concludes that the majority of aromatics are derived from two species, *Pelargonium crispum* and *Pelargonium graveolens*, both with a base number of an $x = 11$. (The zonals and the ivy-leaved have $x = 9$).



Pelargonium tomentosum. From *Icones Plantarum Rariorum* by N. J. Jacquin. Vienna, 1781-1793.

Pelargonium X fragrans has an aberrant base number $x = 8$. Clifford (1970) suggests that this is a real species and not a hybrid. *Pelargonium grossularioides*, the coconut-scented pelargonium, is also unusual with a chromosome number of 38. Daker postulates this an allotetraploid resulting from an $x = 8$ such as *Pelargonium X fragrans* and $x = 11$ such as *Pelargonium australe*.

The cultivar 'Endsleigh' has long been considered a variety originating from a cross between *Pelargonium capitatum* (hexaploid $2n = 66$) and *Pelargonium quercifolium* (tetraploid $2n = 44$). This would make 'Endsleigh' pentaploid ($2n = 55$). In fact, Daker found 54 chromosomes. This substantiates the proposed ancestry although one chromosome has been lost.

Ecology of Scent. Because of the many wild scented pelargoniums, the aromatic foliage must have some biological justification.

For plants in general, several hypotheses have been presented for the existence of essential oils. The first is that the oils are simply waste products being excreted by the plants. Although once popular, this catch-all explanation has generally been discarded and there is no reason to expect that it explains the oils in pelargoniums.

The second hypothesis is that the oils serve to attract pollinators. Because the aromatic pelargoniums do not have showy flowers and yet are adapted for outcrossing (the pollen maturing prior to stigma formation) it is reasonable that the foliage odor may serve to attract pollinators to the plant.

A third hypothesis is that the aromatic oils are allelopathic; that is, they inhibit the growth of other plants nearby. This has been studied on several aromatic herbs in the California desert (Whittaker 1970). It is true that the pelargonium oil does leach out of the foliage with rainfall and it may have some allelopathic effects in the soil. Plantations of pelargonium do contain weeds but there is no reason that the allelopathy could not be selective for certain species growing in association with pelargonium in its native habitat.

A fourth hypothesis is that essential oils serve to repel predators, either arthropod or larger animal herbivores. In their native environment pelargoniums are growing where vegetation is relatively scarce. Hence the pressure from herbivores may be strong enough to justify the development of repugnant oils that would discourage predators.

These last three hypotheses are not mutually exclusive and only further research will explain the biological significance of the essential oils.

Distribution of Varieties and Scents. The following is a list of aromatic pelargoniums and their scents. It has been synthesized from other lists in recent works on pelargoniums. Because of the problems with nomenclature and because many authorities only describe the scent, it is difficult to decide whether conflicting accounts of scents for the same named variety are due to improper naming of one of them or to justified differences in odor interpretation. The list does serve to emphasize the diversity of varieties and accompanying scents. Chromosome numbers (Daker 1969) are given where available and references to descriptions of each variety are coded with each listing.

References ¹	Taxon	Synonyms, proper or improper	Common name	Chromo-some no. (2n)	Scent
1,2,4,5	<i>P. abrotanifolium</i>	<i>P. artemisiaefolium</i>	Southernwood-leaved Geranium	32	Strong pungent diphenyl ether & butyric ester with southernwood
1,4	<i>P. X acerifolium</i> (<i>P. capitatum</i> × <i>P. graveolens</i>)	<i>P. citriodorum</i> , <i>P. aceroides</i>	Maple-leaved Geranium		Pungent spicy
4	<i>P. albescens</i>	?			
3	<i>P. X asperum</i>	?			
1,2,5	<i>P. australe</i>	Not the 'Australis' offered in the U.S.		22	Ladanum & weak citronellal Lemon Spicy
1,2,4,5	<i>P. X blandfordianum</i> (<i>P. graveolens</i> × <i>P. echinatum</i>)			66	Pungent, faint rose
1,2	<i>P. 'Brilliant'</i>				
1,2,3,4,5	<i>P. capitatum</i>			66	Slightly pungent Slight rose
1,2	<i>P. 'Capri'</i>				Slight pungent
1,2,3	<i>P. X citrosum</i>		Queen of Lemons		Strong lemon
1,2,3,4	<i>P. 'Clorinda'</i>	<i>P. quercifolium</i> × Cape sp.			Pepper, southernwood, eucalyptus
1,2	<i>P. cordifolium</i>	<i>P. cordatum</i>	Heart-leaved Storksbill		
1,2,3,4	<i>P. crispum</i>	<i>P. hermaniaefolium</i> or <i>P. 'Lady Scarborough'</i>	Curled-leaved Cranesbill		Lemon, citral
1	<i>P. crispum</i> 'Gooseberry-leaved'				Slightly pungent
4	<i>P. crispum</i> 'Maximum'				Citral & melissa
1,3	<i>P. crispum</i> 'Minor'		Finger Bowl Geranium		Strong citronellal
4	<i>P. crispum</i> 'Minimum'				Strawberry

1,2,3	<i>P. crispum</i> 'Prince Rupert Variegated'	<i>P. decipiens</i>	French Lace	Lemon
2,4	<i>P. cucullatum</i>			Ladanum & citral
1,1,3,4	<i>P. X denticulatum</i>	<i>P. X decipiens</i>		Balsam, fine rose or pine, mint
4	<i>P. X denticulatum</i> 'Sandbach'			Citronellal, ladanum, butyric
1,2,5	<i>P. X denticulatum</i> 'Filicifolium'	<i>P. 'Fernaefolium'</i>	Fern-leaved Geranium	Pungent
2,3,5	<i>P. 'Endsleigh'</i> (<i>P. quercifolium</i> × <i>P. capitatum</i>)			Peppery
2,4	<i>P. exstipulatum</i>			Pennyroyal
1,2,3,5	<i>P. X fragrans</i>		Nutmeg Geranium	Nutmeg
1,2	<i>P. X fragrans</i> 'Old Spice'	<i>P. odoratissimum</i> × <i>P. X fragrans</i>		Spicy
1,2	<i>P. X fragrans</i> 'Snowy Nutmeg'			Spicy
1,2,4,5	<i>P. glutinosum</i>	<i>P. viscosum</i>	Pheasant's Foot, Clammy Cranesbill	Ladanum
1,2	<i>P. 'Godfrey's Pride'</i>			Mint
1,2,3,4,5	<i>P. graveolens</i>	<i>P. capitatum</i>	Rose Geranium	Rose
1,2,3,4,5	<i>P. graveolens</i> 'Attar of Roses'	<i>P. terebinthinaceum</i>		Rose & rue, pep- permint
1,2,3	<i>P. graveolens</i> 'Camphorum'		Camphor Rose Geranium	Camphor
1,2	<i>P. graveolens</i> 'Elkhorn'			Strong rose
1	<i>P. graveolens</i> 'Giganteum'			Slight rose
1,2	<i>P. graveolens</i> 'Gray Lady Plymouth'			Rose
1,2,3,4	<i>P. graveolens</i> 'Lady Plymouth'			Rose, peppermint ?
1	<i>P. graveolens</i> 'Large Leaf Rose'			Strong rose

References ¹	Taxon	Synonyms, proper or improper	Common name	Chromosome no. (2n)	Scent
1,2,4,5	<i>P. abrotanifolium</i>	<i>P. artemisiaefolium</i>	Southernwood-leaved Geranium	32	Strong pungent diphenyl ether & butyric ester with southernwood Pungent spicy
1,4	<i>P. X acerifolium</i> (<i>P. capitatum</i> × <i>P. graveolens</i>)	<i>P. citriodorum</i> , <i>P. aceroides</i>	Maple-leaved Geranium		
4	<i>P. albescens</i>	?			Ladanum & weak citronellal Lemon
3	<i>P. X asperum</i>	?			Spicy
1,2,5	<i>P. australe</i>	Not the 'Australis' offered in the U.S.		22	
1,2,4,5	<i>P. X blandfordianum</i> (<i>P. graveolens</i> × <i>P. echinatum</i>)			66	Pungent, faint rose
1,2	<i>P. 'Brilliant'</i>				Slightly pungent
1,2,3,4,5	<i>P. capitatum</i>			66	Slight rose
1,2	<i>P. 'Capri'</i>				Slight pungent
1,2,3	<i>P. X citrosum</i>		Queen of Lemons		Strong lemon
1,2,3,4	<i>P. 'Clorinda'</i>	<i>P. quercifolium</i> × Cape sp.			Pepper, southernwood, eucalyptus
1,2	<i>P. cordifolium</i>	<i>P. cordatum</i>	Heart-leaved Storksbill		
1,2,3,4	<i>P. crispum</i>	<i>P. hermaniaeefolium</i> or <i>P. 'Lady Scarborough'</i>	Curled-leaved Cranesbill		Lemon, citral
1	<i>P. crispum</i> 'Gooseberry-leaved'				Slightly pungent
4	<i>P. crispum</i> 'Maximum'				Citral & melissa
1,3	<i>P. crispum</i> 'Minor'		Finger Bowl Geranium		Strong citronellal
4	<i>P. crispum</i> 'Minimum'				Strawberry
1,3	<i>P. crispum</i> 'Prince Rupert'				Strong lemon
1,2,3	<i>P. crispum</i> 'Prince Rupert Variegated'	<i>P. decipiens</i>	French Lace		Lemon
2,4	<i>P. cucullatum</i>				Ladanum & citral
1,3,4	<i>P. X denticulatum</i>	<i>P. X decipiens</i>			Balsam, fine rose or pine, mint
4	<i>P. X denticulatum</i> 'Sandbach'				Citronellal, ladanum, butyric
1,2,5	<i>P. X denticulatum</i> 'Filicifolium'	<i>P. 'Fernaefolium'</i>	Fern-leaved Geranium	44	Pungent
2,3,5	<i>P. 'Endsleigh'</i> (<i>P. quercifolium</i> × <i>P. capitatum</i>)			54	Peppery
2,4	<i>P. exstipulatum</i>				Pennyroyal
1,2,3,5	<i>P. X fragrans</i>		Nutmeg Geranium	16	Nutmeg
1,2	<i>P. X fragrans</i> 'Old Spice'	<i>P. odoratissimum</i> × <i>P. X fragrans</i>			Spicy
1,2	<i>P. X fragrans</i> 'Snowy Nutmeg'				Spicy
1,2,4,5	<i>P. glutinosum</i>	<i>P. viscosum</i>	Pheasant's Foot, Clammy Cranesbill	44	Ladanum
1,2	<i>P. 'Godfrey's Pride'</i>				Mint
1,2,3,4,5	<i>P. graveolens</i>	<i>P. capitatum</i>	Rose Geranium	c. 77	Rose
1,2,3,4,5	<i>P. graveolens</i> 'Attar of Roses'	<i>P. terebinthinaceum</i>		77	Rose & rue, peppermint
1,2,3	<i>P. graveolens</i> 'Camphorum'		Camphor Rose Geranium		Camphor
1,2	<i>P. graveolens</i> 'Elkhorn'				Strong rose
1	<i>P. graveolens</i> 'Giganteum'				Slight rose
1,2	<i>P. graveolens</i> 'Gray Lady Plymouth'				Rose
1,2,3,4	<i>P. graveolens</i> 'Lady Plymouth'				Rose, peppermint ?
1	<i>P. graveolens</i> 'Large Leaf Rose'				Strong rose

References ¹	Taxon	Synonyms, proper or improper	Common name	Chromo-some no. (2n)	Scent
1,2,3,4,5	<i>P. graveolens</i> 'Little Gem'	<i>P. terebinthinaceum</i>		88	Pungent
1	<i>P. graveolens</i> 'Minor'		Little-leaf Rose Geranium		Strong rose
1,2	<i>P. graveolens</i> 'Red Flowered Rose'	<i>P. graveolens</i> 'Vandesiae'			Slight rose
1	<i>P. graveolens</i> 'Rober's Lemon Rose'				Lemon rose
1	<i>P. graveolens</i> 'Variegatum'		Mint-scented Rose Geranium		Mint rose
1,2,5	<i>P. grossularioides</i>	<i>P. parviflorum</i> or <i>P. crispum</i> 'Variegatum,' incorrect		38	Coconut
1,3	<i>P. X jatrophaeifolium</i> (<i>P. denticulatum</i> × <i>P. quercifolium</i>)				Oily pungent
1,2	<i>P. 'Joy Lucille'</i>	<i>P. tomentosum</i> × <i>P. graveolens</i>			Strong mint
1	<i>P. X limoneum</i>	<i>P. crispum</i> derivative	Lemon-scented Geranium		Lemon
1,2,3	<i>P. X limoneum</i> 'Lady Mary'	<i>P. X limoneum</i> 'Lady Mary Fox'			Lemon nutmeg
4	<i>P. 'Lady Lumsden'</i>				Ladanum
2,5	<i>P. 'Mabel Gray'</i>			22	Citrus
1	<i>P. X melissinum</i> (<i>P. crispum</i> × <i>P. graveolens</i>)		Lemon balm Geranium		Lemon balm

1,2	<i>P.</i> 'Mrs. Kingsley'	<i>P. rapaceum</i> , <i>P.</i> 'Mrs. Kingsbury' (misspelled)		Slightly pungent
1	<i>P.</i> 'Mrs. Taylor'			Pungent
1,2	<i>P. X nervosum</i>		Lime-scented Geranium	Strong lime
1,2,4	<i>P. odoratissimum</i>		Apple-scented Geranium, Sweet-scented Cranesbill	Apple, tansy, rose
1,4	<i>P.</i> 'Old Scarlet Unique'	<i>P. fulgidum</i> variety		Pungent, butyric
1,2,5	<i>P. papilionaceum</i>		Butterfly Cranesbill	44
1,3	<i>P.</i> 'Pretty Polly'		Almond-scented Geranium	Almond
1,2,3,4	<i>P.</i> 'Prince of Orange'			Orange
1,2,3,4	<i>P. quercifolium</i>		Oak-leaved Geranium	Pungent
1	<i>P. quercifolium</i> 'Beauty'			Pungent & mint
1,2,3	<i>P. quercifolium</i> 'Fair Ellen'			Pungent
1	<i>P. quercifolium</i> 'Fringed Oak'			Pungent
1	<i>P. quercifolium</i> 'Fringed Oak' × 'Fair Ellen'			Pungent
1	<i>P. quercifolium</i> 'Giganteum'			Pungent
1	<i>P. quercifolium</i> 'Prostratum'			Pungent
1	<i>P. quercifolium</i> 'Skeleton's Unique'			Pungent
1	<i>P. quercifolium</i> 'Staghorn Oak Leaf'	<i>P. quercifolium</i> 'True Oak'		Pungent
1	<i>P. quercifolium</i> 'Village Hill Hybrid'			Pungent
1	<i>P. quercifolium</i> 'Variegatum'	<i>P. quercifolium</i> 'Harlequin'		Pungent

References ¹ Taxon	Synonyms, proper or improper	Common name	Chromo-some no. (2n)	Scent
1,2,3 <i>P. radens</i>	<i>P. radula</i>	Crowfoot Geranium		Pungent, mint, balsam
1 <i>P. radens</i>	<i>P. radens</i>			Lemon rose
1,2,3,4 <i>P. 'Skeleton Rose'</i>	'Dr. Livingston'			
1 <i>P. 'Rollison's Unique'</i>				Rose mint
1,2 <i>P. 'Round Leaf Rose'</i>				Rose
<i>P. X rutaceum</i>		Rue-scented Storksbill		Rue
1,2,3,5 <i>P. scabrum</i>	<i>P. graveolens</i> hybrid	Rough-leaved Cranesbill	22	
1,3 <i>P. scabrum</i>	<i>P. scabrum</i>			Pungent, apricot
<i>'Apricot'</i>	'M. Nonin'			
1 <i>P. X scarboroviae</i>	? <i>P. crispum</i> derivative	Countess of Scarborough		Fruity-strawberry
1,3 <i>P. 'Schottesham Pet'</i>		Filbert-scented Geranium		Filbert
1,2,3 <i>P. 'Shrubland Rose'</i>			88	Pungent
2,4 <i>P. 'Shrubland Pet'</i>				Rose & faint strawberry
1,2,3,5 <i>P. tomentosum</i>	<i>P. tormentosum</i>	Peppermint-scented Geranium	44	Peppermint
1,2 <i>P. 'Torento'</i>		Ginger-scented Geranium		Pungent, slight ginger
1,2 <i>P. tricuspidatum</i>		Three-pointed Cranesbill		
2,3,5 <i>P. triste</i>		Balm-scented Cranesbill	66	Sweet scented Citronellal & caproic ester
1,2,4 <i>P. vitifolium</i>				

1. References:

1. Wilson, 1965
2. Clifford, 1970
3. Cross, 1951
4. Holmes, 1913
5. Chromosome numbers from Daker, 1969.



Pelargonium X asperum. From *Revue Horticole*. Vol. 65. 1893.

Geranium Oil. Although pelargoniums are largely associated with horticulture, they have been of considerable importance as a source of essential oil for the perfume industry. Only one actual geranium, *Geranium macrorrhizum*, a minor species, is used occasionally in Bulgaria and other Balkan countries (Guenther 1960); all others are pelargoniums. Although 99% of the oil comes from pelargoniums, the term geranium oil was used historically and is still employed today.

Although they had been cultivated for their scent in Europe for more than a century, it was not until 1819 that the aromatic pelargoniums came to the attention of the perfume industry. They were first commercially grown in fields at the foot of the Maritime Alps near Cannes (Knuth 1921). By 1847 they were in regular cultivation both in Grasse, France and in several locations in the French Province of Algeria. In 1880 plantations were established on the French island of Reunion 500 miles east of Madagascar in the Indian Ocean at altitudes between 400 and 1200 meters where sugar cane, vanilla and manioc could not be grown (Perrot 1915).

Just which pelargoniums are now used, or have been used, for commercial oil production is conjectural, since most of the literature seems to have been produced by people not in a position to accurately identify the plants. It is certain that *P. X asperum* was the major crop in France before 1900. (*Revue Horticole*, 1893). It is also certain the *P. graveolens* was the plant grown in Kenya in the 1920's and 1930's (Hutchinson 1931). What other species or hybrids may be involved must wait until a taxonomist has an opportunity to study the plants.

It is surprising in view of the diversity of odor presented in the previous table that only those pelargoniums with rose scent are used. Holmes (1913) noted this as well, and proposed that others should be considered. The exclusive use of rose-scented pelargoniums is probably due to the extreme popularity and expense of the rose extract from Damascus roses, for which rose geranium oil was a cheap and acceptable substitute. For other scents, the pelargonium counterpart was probably not outstandingly less expensive.

Commercial Culture. For perennial growth, the pelargonium requires frost-free conditions, since a temperature of $+ 3^{\circ}$ C. kills the plant. Hence it can be grown only as an annual in France, while in Africa the plants live five to ten years. Such regional variations result in differences in culture, but the basic technique was as follows:

The pelargonium was propagated by taking 10–12 inch cuttings. The best, it was reported, included a heel of old wood. These cuttings were then placed either directly in the field or spaced 8 inches apart in nursery beds. When the latter cuttings were rooted, they were set out, usually in late autumn (*Bull. Imp. Inst.* 1929). The spacing of the plant varied from 36" each way in S. France, to 12" apart in rows 30" apart in Algeria. The plants were kept weed-free and well-watered where irrigation was available, the application of water resulting in a greater volume of herbage with a slightly lower percentage yield of oil. In Algeria the plants were originally grown on dry slopes where the oil was reported as being of great delicacy. Once the plants became established on low-lying, humid soil, the three-fold increase in yield was balanced by a poorer quality in the "geranium irrigue" oil, and the superior product of dry land was apparently mixed with it to ameliorate the quality.

Depending on the locality, from one to three crops were harvested a year. When three were made in a given year, it was usually followed by two the next, thus making five cuttings in two years. If two cuttings were made, the first was in mid-April when the plants were in full bloom and their usual lemon-like odor had changed to a strong rose. The second would be during late October when the leaves had turned slightly yellow (*Bull. Imp. Inst.* 1932). A third cutting might be made in July if particularly good growth was achieved. In Reunion, the first of three cuttings took 60–70 cm. of growth, the second and third, 25–30 cm. (Perrot 1915). The cutting was done after several days of dry weather, as otherwise the oil yield was very low. Cutting was done by hand with sickles after the morning dew had dried. In Algeria in 1931 native boys were paid 5 francs per day, adults 10 francs per day, whites twice this rate, and the average cost of cutting one hectare (2.47 acres) was 400 francs or 40 man days for a native adult laborer (*Bull. Imp. Inst.* 1932).

The material was stored for 24 hours which permitted some fermentation. This released the portion of the oil stored in the form of B-geranyl glycoside (Guenther 1960). The whole plant, stalk and all, was steam distilled. The sizes of the stills varied from ones holding a 250-kilogram charge that one man could handle, to ones holding 20 metric tons of plant material equipped with electrically driven hoists.² The yield of oil was

² Brown and Islip (1952) have written an elaborate treatise on stills for essential oils for anyone wishing more information on this subject.



Pelargonium denticulatum. From *Icones Plantarum Rariorum* by N. J. Jacquin. Vienna, 1781-1793.

reported as varying from 0.07% in Italy to 0.20% in some areas of France (*Amer. J. of Pharm.* 1918). A hectare in Reunion might yield as much as 30 kg. of oil per year but a more usual figure was 18 kg. (Guenther 1960). The yield depended on the age of the plantation.

Yield of Oil per Hectare (2.47 acres)
kilograms

First Year	10
Second Year	30-35
Third Year	30-35
Fourth Year	25-28
Fifth Year	20-25
Sixth Year	15-20
Seventh Year	6-10

From Guenther 1960

Recent History of Production. In Algeria the production of geranium oil was 31,200 kg. in 1903 (Perrot 1915) and rose to 143 metric tons in 1928 (Guenther 1952). At this point it declined rapidly. This was partly due to the high cost of production, Algeria becoming no longer a colony and hence subject to the same labor laws as France. The gruesome years of war, rebellion and insurrection also took their toll as did increasing competition from the cultivation of grapes and vegetables in the same area (Guenther 1960). Production in the late 1950's was down to between 6 and 15 metric tons per year.

Production on the island of Reunion rose to 120 metric tons per year in 1936–1940 but by 1948 this had dropped to 34 tons. Guenther (1952) cites both the sugar industry luring away labor and the tremendous cyclones which ravage the island regularly. A cyclone on January 25, 1949 killed 150 people, destroyed 70% of the dwellings, 50% of the cattle and 80% of the pelargonium plantations (Guenther 1960). Arctander (1960), however, reports that Reunion in spite of the cyclones now produces 100 metric tons per year valued at 3–5 million U.S. dollars, one half of the world's production.

The French production of geranium oil is at an all-time low and still decreasing (Arctander 1960). Although its quality is high, high labor costs and continual pressure from resorts has virtually eliminated the industry (Guenther 1960).

The world's second largest producer is the USSR (Arctander 1960). Plantations in the Crimea and the Caucasus in 1959 produced 50–55 metric tons, all of which were used domestically.

A rather recent introduction is Moroccan geranium oil. Beginning in 1935, the industry capitalized on inexpensive female labor for harvesting and on modern distillery equipment, and under the management of a French essential oil producer after World War II rapidly became a major producer (Guenther 1960). Problems in establishing this industry included a swarm of locusts in 1947 that destroyed 50 hectares of nursery beds (Guenther 1952). In spite of this, Morocco is now the world's third largest producer after Reunion and the USSR (Arctander 1960).

Congo geranium oil from the Zaïre Republic, Kenya, Tanzania and Angola has been produced for some years and the production is increasing (Arctander 1960). This is oil from *Pelargonium graveolens* and is not to be mistaken for the oil from *P. radens* grown in Kenya, known as Mawah oil. Pelargoniums have been cultivated in Kenya since before 1914 (Hutchinson 1931). It is interesting that with the exception of Kenya, pelargoniums first went to Europe and subsequently were transported

south for cultivation. In Kenya the plants probably came directly from S. Africa. The term Mawah oil has been applied to the oil from both *Pelargonium graveolens* and *P. radens*. Today it exclusively refers to oil from the latter. The word "Mawah" is adapted from the Swahili word "Maua" the plural form of "ua" simply meaning flower (Hutchinson 1931). The odor of Mawah oil is "a bitter-harsh, leafy-woody, slightly earthy, but later toning out to more pleasant rosy, geranium type of odor" (Arctander 1960). It is not a substitute for geranium oil.

The "East Indian" or "Turkish" geranium oil is oil from the grass *Cymbopogon Martini* (Hutchinson 1931).

French financing has established pelargonium plantations in El Salvador that are apparently now past the experimental stage (Arctander 1960).

In addition to Reunion, the USSR, Morocco, Algeria, El Salvador and East Africa, West Africa, Japan, Italy, Haiti, Corsica, Lebanon and India produce annual lots of 1-2 metric tons which are used locally (Arctander 1960).

Although little if any is produced in the United States today, there was once considerable pressure to establish domestic production of geranium oil.

In 1914 the Office of Drug, Poisonous and Oil-Plant Investigations of the Bureau of Plant Industry of the U.S. Department of Agriculture undertook the task of studying the feasibility of commercial production (Russell 1921).

Cuttings of *Pelargonium odoratissimum* (*P. graveolens* ?) were obtained and rooted in Orlando, Florida, in the winter of 1915. Enough plants resulted to plant two acres. From successes and disasters (they all froze out the first year) growers were able to obtain a number of conclusions based on the plantings of 1917-1919. First, they found that the cuttings could be rooted directly in the field. Second, that the plants were frost susceptible. Third, although plants tolerated drought and wet weather well, 24 hours under water was fatal. Fourth, fertilization increased the yield of herbage with a slight decrease in percentage yield of oil. Fifth, because mowing machines simply uprooted the plants, cutting would have to be done by hand unless new machinery could be invented. Sixth, rains prior to harvest reduced the yield. Seventh, that their yield, 0.035%-0.109%, was probably low but with even better yields the monetary returns per acre would vary between \$15 and \$24 per acre per year (Russell 1921). With this conclusion, hardly a promising one, the field was abandoned during the winter of 1919-1920.

In 1923 the Committee on Raw Products of the Association of American Manufacturers of Toilet Articles provided money for further research by the same department of the USDA. Enough plants were left from the previous experiment to set out 5,000 cuttings near Mt. Dora in Lake County, Florida, in 1924. This plantation failed to survive due to neglect. A second planting in 1925 died of drought. In 1928 new assistants were obtained; cuttings were established in 1929, and 0.39 acres planted. The first harvest was made in October 1928 and a second in June 1930 (Sievers, Lowman and Marshall 1932).

Experimental plantings were also set up at Harlingen and Raymondville in the Lower Rio Grande Valley in Texas. These plants froze out in December 1929.

Plantings in 1924 were undertaken in National City and San Jose, California. Mixups resulted in no yield from these plants. A cold spell killed all the plants in San Jose. Plants set out in Calipatria, California, died of summer heat.

In 1925 cuttings were set out on a fifth of an acre in the United States San Diego Acclimatization Garden at Torrey Pines, California. This planting was harvested in 1926, 1927, 1928, 1929, 1930 and 1931. Experiments were conducted on the effects of nitrogen fertilizers either alone or in combination with irrigation. In 1931 these experiments were shifted to a large ranch near Tustin, California. Four one-quarter acre plots were established and studies of the effects of soil type and irrigation were done.

The final conclusions of the investigators were that Texas and Florida were unsuited for commercial production because of frost. In southern California plantations would need irrigation, but if this were provided, three yearly harvests could be obtained on fertilized land. Based on a maximum yield of 25 pounds of oil to an acre, they concluded that the crop could only be grown with labor saving devices (Sievers, Lowman and Marshall 1932).

I have not heard of any further attempts to make this a profitable agriculture commodity in this country.

Although steam distillation was the only extraction technique used in the majority of localities, by 1937 in Grasse (Naves and Mazuyer 1947) a geranium concrete was being produced. A concrete is made by extraction with petroleum ether or benzene. The advantage of this technique is that the yield is somewhat improved. In 1937 fifty tons of herbage yielded 0.20-0.25%.

The geranium concrete is a dark green or brownish-green waxy mass. The odor is an intense earthy-herbaceous, sharp-rosy, foliage green one with great tenacity (Arctander 1960). It is best for soap perfumes, adds body to rose perfumes and blends well with spicy additives. Morocco in the 1950's was the largest producer of geranium concrete, producing 5 tons per year.

In Morocco an alcohol extraction of geranium concrete also is done removing waxes and terpenes. When the alcohol is subsequently evaporated the product is known as geranium absolute. Usually a liquid, it is entirely soluble in alcohol and hence is ideal for fine perfumes (Arctander 1960).

Although largely used for perfumes, geranium oil is occasionally used sparingly for flavoring with rich and sweet flavored materials such as vanillin, clove oil, patchouli oil and bergamot. Old fashioned toothpaste occasionally still contains small amounts of geranium oil (Arctander 1960).

The odor of raw geranium oil varies in different regions. In Reunion it is described as "very powerful: green, leafy-rosy, with a pronounced fruity-minty undertone and a rich, long-lasting dryout" (Arctander 1960). The Algerian oil is "lighter more rosy-leafy, less minty . . . and the rich, sweet-rosy dryout undertone is more pronounced" (Arctander 1960).

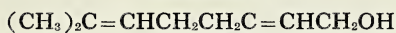
The variation in the oil produced in different regions may be due partly to differences in the variety of the pelargonium grown. Climate, however, also plays an important part. Experiments of the International Commission for Applied Ecology in association with UNESCO in 1957 established a series of plantings in the Middle Limpopo River Valley. The area is African savannah where the annual rainfall is less than 10 inches. Examination of oils from plants of the same variety grown in different locations within this area revealed surprising variation in oil type. The oil from plants grown on high land was distinctly related to the Algerian type while those plants growing along the river in an area of greater humidity produced oil with characteristics similar to Bourbon (Reunion) oil (Sholto-Douglas 1969).

Chemical Constitution of Geranium Oil. Geranium oil primarily contains geraniol and citronellol, the mixture of which makes up 75-80% of the oil. This percentage and the ratio of the two alcohols varies with the origin of the oil. These alcohols are usually found partly as esters with acetic, isobutyric, isovaleric and tiglic acids. In addition to these major components the following chemicals have been isolated from gera-

nium oil: dimethyl sulfide, ethyl alcohol, diacetyl, isoamyl alcohol, 1- α -pinene and β -phellandrene, *d*-3-methyl-1-pentanol, 3-hexen-1-ol, *n*-1-hexanol, methylhexyl carbinol, 1-isomenthone, linaloöl, α -terpineol, menthol, 2-phenylethanol, eugenol, sesquiterpenes, and sesquiterpene alcohols and a paraffin (Guenther 1960).

Structure of

Geraniol



Citronellol



The physicochemical properties of the oil such as specific gravity, optical rotation, refractive index, ester and alcohol content vary with the origin and all are measured regularly as a check for adulteration. Adulteration can be very sophisticated and techniques for detecting it equally so.

Medicinal Use of Pelargoniums. Although neither geranium oil nor geraniol is recognized as having medicinal applications in the United States, Watt and Breyer-Brandwijk (1962) discuss several medicinal uses of aromatic pelargonium species by tribes in southern Africa. In general the pelargoniums are used by the natives for relief of diarrhea and dysentery. Some species are used for treating syphilis. *Pelargonium fumaroides* is claimed to bring on the menstrual flow and with celery or mint is used for abortions. Among the aromatic pelargoniums, *P. alchemilloides*, the Clammy Cranesbill, is reported used by the Xhosa as a paste for healing wounds. A decoction of another variety of this species is supposedly used by the Sotho of Basutoland to wash feverish patients. *P. cucullatum* is used as a decoction for colic, nephritis, and in suppressing the urine. The root of this species is used to cure diarrhea, the leaf as a dressing for open sores and an antispasmodic. *P. grossularioides* is used to stimulate expulsion of the placenta, the onset of menstruation and parturition. The Nama apparently also use it for anemia, fever and general weakness. In the Malay archipelago it is used as a menstrual stimulant and an abortive (Watt and Breyer-Brandwijk 1962). A curious mechanical danger associated with some of the pelargoniums is that the points of some fruits are sharp enough to enter the flesh and kill sheep (Pammel 1911).



Pelargonium odoratissimum



Pelargonium inquinans

Both from Horti Elthamensis
Plantarum Rariorum by
J. J. Dillenius. London, 1732.

Pelargoniums in the Home. For the individual gardener, aromatic pelargoniums are pleasantly easy to grow. Cultural requirements are basically those used for the other cultivars as well.

Propagation is ordinarily done by cuttings either from your own or someone else's plants. Although seeds may be available for some varieties, they do not always come true and the majority of the seedlings grow very slowly. Cuttings are made with a sharp knife from the soft green wood of well-grown, stocky plants at a time when the plant is making good growth. The cut should be made just above a node and preferably where the remaining node faces outwards (the resulting shoot producing a more pleasing parent specimen). The cutting is then trimmed off just below a node, as the roots only develop from the node and any material below this will simply rot. Cuttings should be about three inches long or should contain about three nodes. All but the new top leaves and perhaps one mature leaf should be gently stripped off.

Rooting can be done in water, in moist sand or perlite, or in compost. Jiffy-7™ Peat Pellets are popular self-contained peat-filled compressed tablets that swell up when soaked and are very good for rooting cuttings provided they are not overwatered. The major cause of death of cuttings is "black leg" wherein the stem simply rots completely. The fungus causing this can be stopped by using a fungicide in the water or by being careful not to overwater.

When the cutting has developed roots it should be potted up. The British favor a soil mix of their own called John Innes Compost Mix. For Americans a suitable equivalent is the Cornell Mix. A peck of this can be made by mixing four quarts of vermiculite or perlite, four quarts of shredded peat moss or sphagnum, two level tablespoons of ground limestone, and four level tablespoons of 5-10-5 fertilizer (Carleton 1967). As to the fertilizer any composition will suffice as long as the last figure is similar to the first, i.e., 10-10-10. Avoid lawn fertilizer, 30-10-10, which is unnecessarily high in nitrogen.

For the city dweller who is not prepared to mix his own soil, the pre-mixed Jiffy Mix™ can be purchased, and when mixed two parts Jiffy Mix™ to one part perlite or vermiculite is an ideal, clean, sterile, easy-to-handle substitute.

The rooted cuttings should be potted in three-inch pots. Clay pots are better aerated and hence need more watering than those of plastic. The current trend is to switch entirely to the

plastic. This simply requires a little less water and a slightly better drained potting mix with more perlite, vermiculite or sand. When the roots of the young plant appear through the holes in the bottom of the pot, or it is clearly outgrowing the pot, it should be repotted in a four-inch pot. This is usually large enough unless you wish specimen plants; then larger pots may be used.

Outdoors all the aromatics except for *Pelargonium tomentosum* thrive best in full sun. Indoors they should be placed where they get as much sun as possible. Should sunlight be unavailable, artificial light when properly used can produce startling results. Perhaps the best new book on this subject is by Kranz (1971). Lamplight gardening, as they call it, can be done under the purplish Gro-lux fluorescent lights or under cool white fluorescent lights. Since scented pelargoniums are not grown for their flowers and rarely bloom in winter, the requirement for incandescent lights with the fluorescent is superfluous. Cool white fluorescent lights six inches apart and hung twelve inches over the plants will permit them to grow normally without any sunlight. Incandescent lights alone do not provide enough intensity.

I have postponed the subject of pinching back or stopping the young plants because the ultimate desired shape will delimit the approach. For specimen plants, stopping the young cutting once it is established will cause it to branch; subsequent stopping of these branches will result in a lovely bush shape. This of course depends on the variety. *Pelargonium X fragrans* will produce an upright bushy plant while *P. tomentosum* tends to be viney and runs along the ground.

The scented-leaved pelargoniums as well as the zonals make impressive standards. A standard is a plant with a single tall stem capped with a ball of foliage. Varieties of *P. graveolens* and *P. quercifolium* make excellent standards. Lateral buds should be pinched off at the main stalk as they develop and only when the desired height has been reached should the top be pinched back. Standards can be produced with stems as high as six feet but a more modest height would be desirable for beginners. Stake the plants well, for standards are very susceptible to wind damage.

Many of the *Pelargonium crispum* varieties and others with small leaves can be made into bonsai. For those with similar patience some plants can be espaliered on walls and fences.

The plants always make impressive growth in the summer and by winter there are too many to take indoors. Cuttings may be taken in August and the parents discarded. During the win-

Right: *Pelargonium capitatum*.
 From Horti Academici
 Lugduno-Batavi Catalogus
 . . . by Paul Hermann.
 Leyden, 1687.



Left: *Pelargonium*
exstipulatum. From
Geraniologia by C. L.
 L'Heritier de Brutelle.
 Paris, 1787-1788.



ter pinch them back occasionally and turn them so they do not grow lopsided. The major insect pests of the indoor aromatic is the white fly. This is difficult to eradicate but Malathion is effective if the treatment is repeated within a week. There are other occasional pests but to enumerate them would make their occurrence appear more than rare.

Indoors the simple presence of healthy plants is reward enough regardless of display technique. Usually they are crowded up against the window so as to obtain the maximum light on those dark winter days. Although the plants will not thrive except in a sunny window or under artificial light, the owner should not hesitate to move them to a dim location for a special occasion. The few hours spent away from good illumination is not damaging and will provide a special delight.

Outdoors the gardener is free to devise all types of display. Planters, tubs, hanging baskets all can be used. The individual habit of each of the aromatics may suggest its own best display. The important thing is to grow them close to the path or within people's reach, for it is through rubbing or crushing a bit of the foliage that one most appreciates the aromatics. They are perhaps most popular in gardens for the blind where they can be smelled and enjoyed by the sightless.

Non-commercial Uses. Although geranium oil production is not practical in the home, there are numerous uses for the leaves of the scented pelargoniums. For those who still remember the sentiments that scents once were given, a sprig or leaf can be used as a messenger: rose for preference; nutmeg for unexpected meeting; and lemon for expected. It now has become traditional to place a leaf of rose geranium in the bottom of the glass when making apple jelly. Not only is the deeply cut leaf attractive but it adds a delightful accent to an otherwise bland jelly. The tiny leaves of lemon scented *Pelargonium crispum* are floated in finger bowls, and hence its name, the finger-bowl geranium. Crushed leaves of rose, lemon and peppermint-scented geraniums when boiled in water produce an extract that is a delightful addition to tea, either hot or iced. Branches of a scented pelargonium can be used in flower arrangements. Not only do they replace the function of the florist's asparagus "fern" but their aroma adds much to the bouquet, if its flowers were chosen for color rather than scent.

Young plants make lovely gifts for new brides, apartment dwellers and others. Their ease of culture should permit everyone to have several on hand for such gifts. There is really no

limit to the uses of these plants; their lovely foliage in its myriad forms and scents invites creative approaches. One common use is in a potpourri. I give Helen Van Pelt Wilson's (1965) recipe below:

On a dry day after several days without rain collect leaves of rose scented *P. graveolens* varieties, some lemon scented *P. X limoneum* and *P. crispum* and a very few peppermint *P. tomentosum*. These should be spread on some screens to dry in the shade. By turning them regularly they should dry in a week. Add a fixative, orris root or benzoin or styrax at a rate of one ounce to one quart. Place these leaves in a jar and add spices at a rate of one tablespoon for one quart of leaves. Cloves, cinnamon, allspice, mace, and powdered nutmeg may all be blended. Fill jars two-thirds full and stir well. Cover tightly and let stand for six weeks, stirring every few days. When opened the jars will provide a potent and long lasting aroma largely of pelargonium.

This has been a discussion of one group of pelargoniums, those with unusually scented leaves. I have tried to present some of the facts about their biology, history and cultivation and to convey something of the enjoyment obtained by growing them. Since the latter is largely subjective and emotional, I may have restrained myself too much. I can only urge everyone to consider growing these plants either singly or in a collection. They have had a showy history, a neglected present, and merit a popular future.

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(The author is a graduate student in the Department of Biology at Harvard University. This is a portion of a term paper prepared by him for Biology 104; additional notes have been supplied by Gordon P. DeWolf, Jr.)

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Lilies and the Arnold Arboretum

No article with this title could possibly start without reference to E. H. Wilson and the Regal Lily. Despite all that has been written and said about this lily and its introducer, the full story of its impact on gardens and gardeners will probably never be fully documented. Up until recently, at least, Regal Lilies were still growing in the garden by the house where Wilson used to live at the Arnold Arboretum in Jamaica Plain.

A very good example of Wilson's writings and feelings about the Regal Lily first appeared in "The Lilies of Eastern Asia". In "that little-known hinterland which separates China proper from the hierarchy of Lhasa . . . there in narrow, semi-arid valleys, down which thunder torrents, and encompassed by mountains composed of mud-shales and granites, whose peaks are clothed with snow eternal, the Regal Lily has its home. In summer the heat is terrific, in winter the cold is intense, and at all seasons these valleys are subject to sudden and violent wind-storms against which neither man nor beast can make headway. There, in June, by the wayside, in rock-crevices by the torrents edge, and high up on the mountainside and precipice this lily in full bloom greets the weary wayfarer. Not in twos and threes but in hundreds, in thousands, aye, in tens of thousands. Its slender stems, each from 2 to 4 feet tall, flexible and tense as steel, overtopping the coarse grass and scrub and crowned with one to several large funnel-shaped flowers more or less wine-coloured without, pure white and lustrous on the face, clear canary-yellow within the tube and each stamen filament tipped with a golden anther. The air in the cool of the morning and in the evening is laden with delicious perfume exhaled from each bloom. For a brief season this lonely, semi-desert region is transformed by this Lily into a veritable fairyland."

A hundred miles or so to the southwest, Wilson discovered another lily new to science which he named "in compliment to the late Mrs. Charles S. Sargent, artist and lover of flowers, the wife of Professor C. S. Sargent, the famous dendrologist and Director of the Arnold Arboretum of Harvard University." This lily, *L. sargentiae*, along with *L. regale*, and *L. davidii* were intro-

duced to American gardens by Wilson. Also, he was responsible for *L. henryi* becoming common in cultivation.

The Regal Lily was discovered in August, 1903. In 1908 Wilson shipped a few bulbs back to the Arnold Arboretum and to some friends, but in 1910 he succeeded in introducing it in quantity to America, and the stock passed from the Arnold Arboretum to Farquhar and Co. in Boston. Perhaps Wilson should have the last word, here, about this lily. He felt "it will thrive where the common Apple can be successfully grown." He said that under cultivation it had "behaved royally, being equally indifferent to winter colds, summer droughts, and deluges and has flowered and fruited annually." He pleaded with the gardener that "all who possess or will possess this treasure not to ruin its constitution with rich food."

Although the Regal Lily has been superceded in favor with many gardeners by the fine modern trumpet strains of lilies, there are still gardeners who cherish and grow *Lilium regale* in its pristine, true species form and consider it still one of the best of all lilies.

II

In the fall of 1962 the, so-called, "Lily Demonstration Plots of the Arnold Arboretum" were established at the Case Estates in Weston. This was a cooperative effort between the New England Lily Group of the North American Lily Society and the Arnold Arboretum. Seventeen societies, nurseries or individuals contributed the bulbs to the test garden. Included were a wide range of species and cultivars.

For a period of nearly ten years, various observations were made on this collection. Dr. Donald Wyman has turned over to the writer all the literature accumulated by him and his workers which was recorded during this period. One entire issue of *Arnoldia*, Vol. 20, No. 10, November 6, 1964, was devoted to a detailed study of about 250 species and cultivars in the collection that had been studied up to then. Dr. Wyman called this article "Lilies In Their Order of Bloom". The name of each lily, the week the first flower opened, number of days in bloom, number of flowers per stalk, size of flower, height of stalk, color of flower, and shape of flower were recorded. A few copies of this popular issue are still available at the Arboretum.

As the years went by it became obvious that certain lilies in the plot were better "doers" than others. The idea arose that this group of lilies could be of great value to the average gardener, who could not bother with fussy lilies and who would like to know which ones could be relied upon to perform well under average or even poor garden conditions.



E. H. Wilson and lilies, just after he received honorary doctorate from Trinity College, Hartford, Conn. Arnold Arboretum photo, 1930.

In the last few years no effort was made to give special care, fertilizer or insect repellent to these lilies. Some died out completely, others lived on in quite undesirable stages; but others thrived and even increased to large clumps, performing well in full sun, surviving drought, animal predation and about every evil that could befall a lily.

During these years of experimentation a misunderstanding arose with the New England Regional Lily Group. Because of the unpleasant appearance of these beds, at one of their meetings in 1971 the President of the group stated that "the lily display at the Case Estates is a disgrace." After some discussion of who initiated the planting and who was supposed to care for it, it was suggested that the NERLG name be removed from the display and that the Case Estates be asked what could be done about maintenance. The many visitors who saw the lily beds and made notes on those that did well, and those that did not, under trying conditions have profited by what may have appeared shabby at the time. It is significant that no crosses of *L. auratum* by *L. speciosum* were among the survivors.

For the first time the final results of this experiment are offered to the gardener for what they are worth. Only those that did very well are considered here. Those followed by an asterisk did exceptionally well.

'Adagio'	'Harmony'
African Queen strain	'Life' *
'Alcan' *	'Luna' *
Amber Gold strain *	'Mystic Star'
'Black Beauty' *	'Overture'
'Bright Star' *	<i>L. pandalinum giganteum</i>
Burnished Gold strain	'Red Bird'
'Canary'	'Shuksan'
'Corsage' *	'Sonata'
'Destiny'	'Stardust' *
'Discovery'	Sunburst Pink strain
'Dora Pinow'	'Sunlight'
'Enchantment'	'Tarantella'
Golden Clarion strain	'Thunderbolt'
Golden Showers strain	<i>L. tsingtauense</i>
'Greatheart' *	

During the same time period, another group of 17 cultivars and species were planted at the Case Estates for testing in heavy shade beside what is known as the "wood road". Of these, the Bellingham hybrids, *L. tsingtauense*, Gay Lights, and *L. hansonii* have persisted under "natural conditions" and are still performing well.



Lilium 'Corsage'. Photo: G. Pride.





A *Lilium* × *Parkmannii* hybrid. Photo: G. Pride.



III

Our most recent and continuing involvement with lilies concerns a remarkable collection of "Parkmannii hybrids" now being tested at the Case Estates. At their request, an agreement was made in the fall of 1971 with the Sun Valley Bulb Farms, Inc. of Oregon. They would supply us with 600 bulbs of this famous cross, and we would observe these plants for a period of 4-5 years doing nothing special in fertilizing, spraying or in any way "fussing" with them. Generally these lilies, which are called in the trade "Oriental hybrids," are considered very susceptible to disease, and some nurseries have them plastered with insecticide and fungicide from the time they come out of the ground until they die down in the fall to avoid disease.

A talk given by the writer at the national meeting of the North American Lily Society in July 1971 stressing the need for disease resistance in lily breeding programs led to this agreement. Very few East Coast lily fans seem to grow these beautiful *speciosum-auratum* hybrids. Because of their lack of disease resistance, they fail to live on year after year. Good lilies should form clumps in five years from a single bulb. The plan is to divide the bulbs of the survivors between the bulb company and the Arnold Arboretum at the end of a five-year period. They will be used for further breeding work and testing.

During the flowering season from June to August in 1972 and 1973, when this large bed of lilies was in bloom, they created a sensation. Mostly in shades from white through pale pink to deep rose, with flowers from *L. speciosum* size up to about 1 foot in diameter and with a heavy, sweet fragrance, they were the center of attention.

Even during the first year, dozens of them died. It was not unusual to have a lily die out completely while another seedling a few inches away was not only living but increasing. Most of those that survived increased noticeably in height and performance the next year.

In a way, it is appropriate that we be involved with perfecting this type of lily. The first cross made and the flowering of what is perhaps the most famous of all lily hybrids took place in Jamaica Plain a few hundred feet from where the Arnold Arboretum is now, at a time just before the Arnold Arboretum was conceived. It occurred in the garden of Francis Parkman, whose home was on the shore of Jamaica Pond. Parkman, who was also a professor of horticulture at the Bussey Institution, started experimenting with hybridizing lilies in the 1860's. His main concern was to combine "the two superb Japanese lilies, *L. speciosum* and *L. auratum*". After several years of

hard work and considerable patience, he flowered this now-famous seedling. Parkman described this remarkable flower with restraint by saying, it "opened on the seventh of August and proved a magnificent flower, nine and a half inches in diameter, resembling *L. auratum* in fragrance and form, and the most brilliant varieties of *L. speciosum* in color. In the following year, it measured nearly twelve inches from tip to tip of extended petals, and in England it has since reached fourteen inches. A colored plate of it will be found in the *Florist and Pomologist* of March, 1876, and engravings of it have appeared in the *Gardeners Chronicle* and other horticultural publications. The stock has been placed in the hands of Mr. Anthony Waterer, the distinguished nurseryman who has given it the name of *L. Parkmanni*."

Accompanying the plate of *Lilium* × *Parkmannii* in the *Florist and Pomologist* for 1876 was a comment by the editor which is well worth repeating, "the limits of our ordinary page are so inadequate to represent the aspect of this noble flower, that we have found it necessary to adopt a double-page illustration, which we think will show that we have by no means been guilty of exaggeration in describing Mr. Parkman's Lily as magnificent, and one of the grandest flowering plants yet introduced to our gardens."

Mr. Parkman increased this one bulb to a stock of about 50 by bulb scale propagation and sold the whole lot to Mr. Anthony Waterer of England for \$1,000.00. It flowered for Mr. Waterer in 1875. The published color reproduction of the lily was made from his plants. However, disease took its toll and all bulbs of this remarkable lily died before it could be placed on the market.

Through the years many hybridizers attempted to re-create this hybrid but all failed until 1914 when a Mr. O. S. Hayward of England succeeded in making the cross again. E. H. Wilson described it then as *Lilium* × *Parkmannii* var. *Haywardii* and wrote that "Mr. Hayward is to be congratulated on his triumphant success." Since this time the cross has been made many times, and the resulting seedlings have been crossed and re-crossed. The collection we are testing is essentially this type.

Visitors coming to the Case Estates to see these lilies should remember that they are involved in an experiment that may eventually lead to some new, fine, hardy lilies that can be enjoyed widely here in the East with less danger of loss from disease. Let the beauty of the survivors compensate for the dead and dying that may be seen nearby.

GEORGE H. PRIDE



Monarch butterfly



Song sparrow. Photos: R. Weaver.

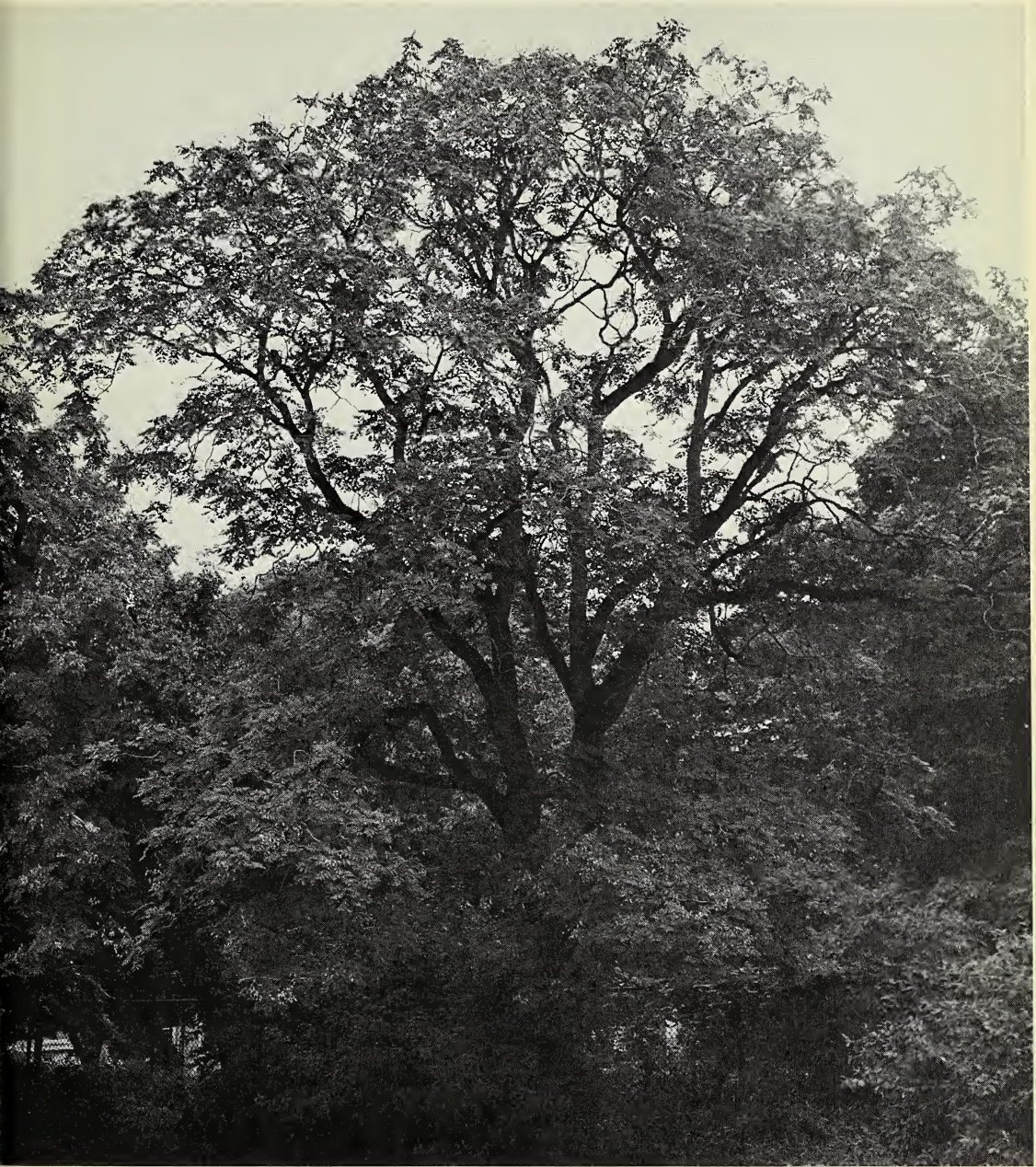
A Group of Outstanding Goldenrain Trees (*Koelreuteria paniculata*) Along Boston's Fenway

Among the very fine and unusual trees planted in Boston's Back Bay Fens is a group of four Goldenrain Trees (*Koelreuteria paniculata*), located near the intersection of Boylston Street and the Fenway, close to the Willow Oak that was featured in the first article in this series on outstanding trees of the Boston area (*Arnoldia* 33(5): 292-294. 1973). The best specimen in the group, and a truly outstanding one, stands 46 feet tall, with a spread nearly equal to the height and a trunk diameter of 22 inches. Another tree just beside this one, shorter and not in as good condition, has a trunk diameter of 24 inches. These are the largest specimens of this species that I have seen in Massachusetts, and they were probably part of the original plantings in the Fens.

The Goldenrain Tree, the only arborescent member of the primarily tropical Soapberry Family that is hardy in the Northeast, is native to Japan, Korea, and western China. It was introduced into cultivation in 1763, but in most parts of this country it is still relatively rare. However, it has several attributes which would argue for its being planted more often. The mustard-yellow flowers borne in large, open, upright clusters appear in June when few trees are in bloom. In fact, this is one of the very few hardy trees with truly yellow flowers. The inflated, papery fruits, green changing to brown, are also conspicuous and attractive, and they frequently persist well into the fall. The trees grow well in a wide variety of soil types.

Goldenrain Trees are escaping from cultivation in several parts of the United States. Seedlings have been found in three places in the Boston area: in the Fens, here at the Arnold Arboretum, and on the Harvard campus along Memorial Drive in Cambridge. There are also a few saplings at the last site. However, all groups of seedlings are growing in close proximity to mature trees, so it appears that the Goldenrain Tree is not becoming truly naturalized in Boston.

RICHARD E. WEAVER, JR.



Koelreuteria paniculata. Photo: N. Page.

Arnoldia Reviews

Exotic House Plants. A. B. Graf. E. Rutherford, N.J.: Julius Roehrs Company. 1973. 176 pages, 1200 illustrations. \$7.50.

Originally issued in 1953 as a guide to common as well as unusual house plants, this 8th edition, profusely illustrated with photographs, presents a changed format and benefits from the corrections of nomenclatural errors. The volume is compact and reasonably priced. Illustrations are grouped in eighteen categories and a few general plates are in color. Cultural directions are given in an introductory section and each illustration is accompanied with a graphic symbol designed to suggest a house plant, or one better grown in a greenhouse; also, the requirements of temperature, light, moisture, and soil type. An alphabetical index of scientific names supplies each with a modicum of miscellaneous information and is followed by an index of common names. A handy, useful, and recommended volume continuing an admirable tradition of illustrative plant handbooks.

RICHARD A. HOWARD

Pots and Pot Gardens. Mary Grant White. London: Abelard-Schuman. 1969. 160 pages, illustrated. £1.90.

Not to be equated with other recent books on the popular subject of container gardening, this little English volume offers a comprehensive treatment of an art which originated in ancient Greece and continues to flourish in the Mediterranean area.

Few gardeners have access to the traditional earthenware and terracotta pots which the author describes, and many of the plants she recommends are unsuited to our climate; but the classic concept of a pot garden is a valid one, distinct from today's ubiquitous redwood and plastic planters.

Anyone interested in creating an adaptation will find this a useful guide, as will the potter in search of authentic and pleasing designs. These are copiously illustrated in over 100 black and white photographs which underscore the need for artistry in the selection, planting, and placing of garden pots.

JEANNE S. WADLEIGH

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ARNOLDIA

Arnold Arboretum Vol. 34, No. 4 July/August 1974



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Handbook on WILD PLANTS IN THE CITY

Text: NANCY M. PAGE
RICHARD E. WEAVER, JR.

Drawings: ROBERT OPDYKE

Photographs: NANCY M. PAGE

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*Cover: Queen Anne's Lace (Daucus carota), growing near
Boston's waterfront. Photo: N. Page.*

Wild Plants in the City

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The curious gardens of wild greenery that penetrate cracks in city pavement and grow lushly on old building lots are produced primarily by plants which have immigrated from overseas. A few of them were brought originally to North America as garden plants and have since run wild; but most have slipped in accidentally, their tiny seeds caught in the belongings and supplies of settlers or mixed with the seeds of commercial crops.

Many of the most common weeds we find growing in our cities date far enough back into man's history to have grown in the settlements of ancient Greece and to have marched across Europe with the Romans. Man seems to have produced the conditions they require to flourish, and it is largely through his agency that they have come to assume such prominence throughout the world. By destroying the native vegetation with his towns and roads, fields, pastures and gardens, civilized man has opened the way for weeds; and through his wide-ranging travels, he has helped scatter them to every corner of the earth.

The aggressive characteristics which suit these weedy plants so well to their role as pioneers on cleared sites are the same traits which make them troublesome to gardeners. They are a vigorous, adaptable and tenacious group, well-equipped to seize a quick foothold and thrive where other plants cannot effectively compete with them. They grow well even where soil is deficient in nutrients; often where it is too dry or too moist, too alkaline or too acid. They grow fast enough to surpass their struggling rivals, and they produce unusually abundant seed crops that are apt to fill the surrounding soil with their offspring. Their seeds may be able to lie dormant in the soil for decades, if necessary, until conditions are favorable for germination — and it is suspected that some may last for centuries.

The ease with which the more common weeds have spread from one site to another, and from one part of the world to



another, is explained largely by their enormous production of easily dispersed seeds. Nowhere is this more apparent than in the midst of the city, where the bare soil of new sites becomes settled with plants almost overnight. Where do these seeds come from? Some, of course, already may be present in the soil of a new lot, and merely need to be brought closer to the surface through cultivation or bulldozing in order to germinate. Other seeds are carried into a new site with the fill used to cover the foundation of a demolished building, or in the topsoil of a landscape planting. Still others, such as the seeds of Poplar, Dandelion and Milkweed, are equipped with silky parachutes which allow them to float on wind currents from surprisingly long distances. Heavier seeds are dropped by nearby trees, and seeds contained within edible fruits and berries often are scattered by feeding birds and animals. Seeds also are transported on fur and clothing, in mud on the soles of shoes, and on the wheels of vehicles.

This continual invasion of seeds helps explain the speed with which weeds can colonize a bare site, even when there are few other plants in view. Within a year a vacant lot's cleared surface may be covered with plants, and within two years tree saplings may be evident. Within three or four years, an undisturbed lot will be wildly overgrown.

But few lots have an opportunity to actually reforest themselves, for the wild gardens that occupy these areas in the city tend to have a fleeting life. Few are left completely undisturbed for more than two or three years, and they often are replaced so rapidly with one of man's constructions — an asphalted parking lot, a used car lot — that the transformation can be somewhat startling to observers.

The role of these wild plants in the city is an especially ambiguous one. Their presence is often a mark of neglect and poor land management, yet the spontaneous cover they provide is a welcome improvement over the rubble-strewn and dusty wastelands which otherwise would be in view. They raise questions about the use and management of vacant land in the city, for when land is so precious, one wonders how these "wastelands" can be economically and socially expedient.

This is a rather typical building lot, slightly on the seamy side, but already lushly carpeted with Clover and Mugwort (and a less typical Grass) after a few years of growth. The trees springing up along the foundations of adjacent buildings are saplings of the Tree of Heaven.

Despite its untidyness, the wild plant growth on these lots has many delightful qualities. Even the seamiest site conveys an intriguing sense of life and a connection with nature that is often lacking in the simplistic environments of contemporary parks and playgrounds. It offers the diversity of an entire community of plants and insects; a surface that has contours, slopes and hollows; and the pleasant surprise of new perspectives and contrasts: the wild lushness of a weedy planter set against the elegance of Copley Square, sheer cliffs rising against the Boston skyline, or an unexpected puddle of water surrounded by Cat-tails and Sedges.

A Note on Trees and Shrubs

In contrast to the vast number of foreign flowers and grasses which were introduced accidentally into the United States and now grow wild in New England towns, the trees and shrubs one is apt to encounter growing wild here are either native plants or plants which were intentionally brought here for cultivation.

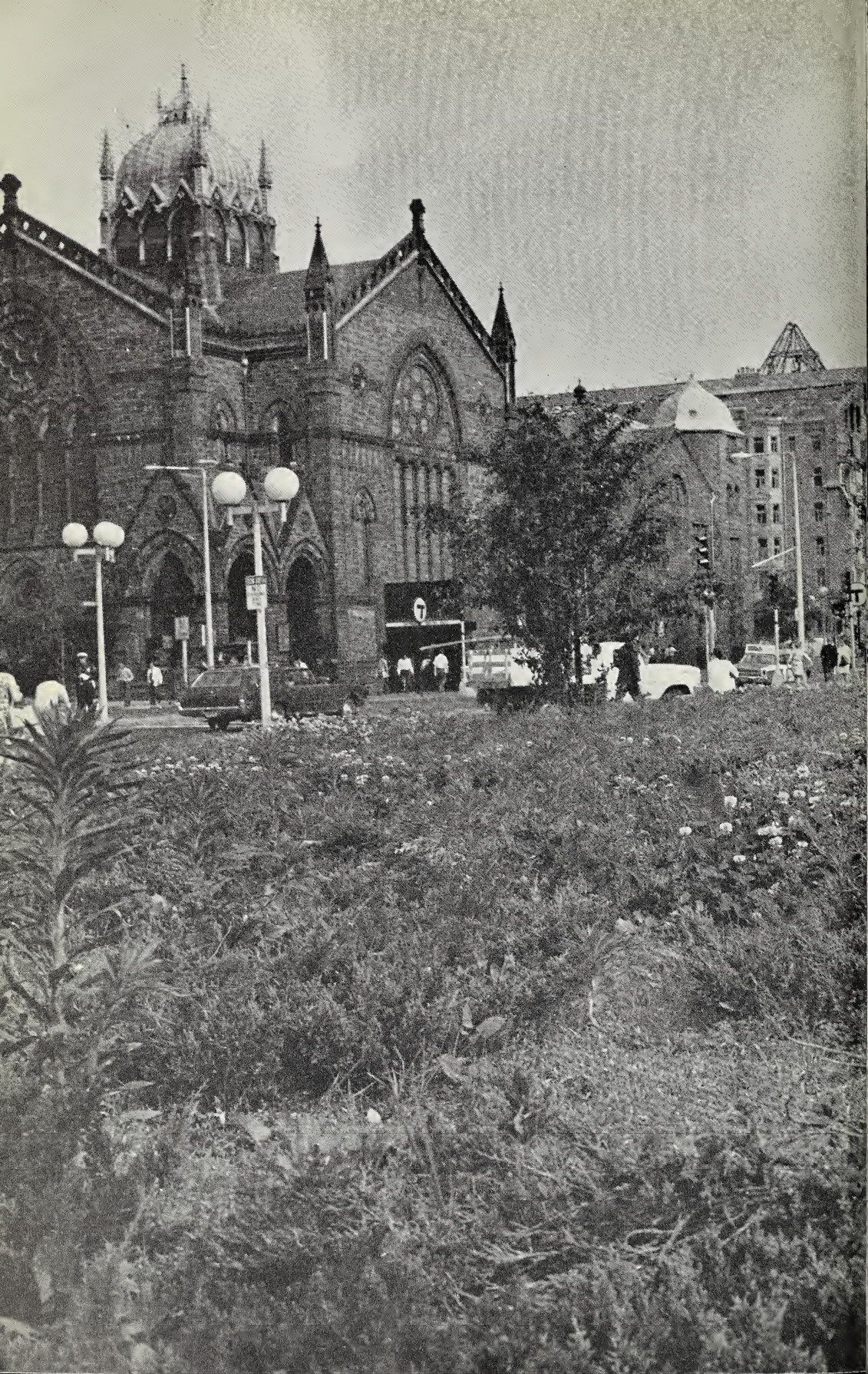
On the following pages we have provided only a small sampling of these woody plants; there are many others which most certainly will be encountered as well — such as the Apple, Catalpa, Horsechestnut, Mulberry, and Linden. Exactly what one finds in a particular area depends, of course, on what has been planted there. For instance, the large number of volunteer Maples, Oaks, and Elms which spring up in Boston may be attributed to the use of such trees for street plantings. The potentially large number of other trees and shrubs which may appear, depending on the breadth of local plantings, is suggested by the wide variety of exotic seedlings one finds growing on the Arnold Arboretum grounds and within a few miles of its boundaries.

One group of plants is notably absent in the city, however, and this is the evergreens. Nowhere in urban Boston have we seen seedlings of such evergreens as the Pines or Junipers, which are such prominent pioneers of the old fields in more rural areas.

This is one of a series of tiny ponds we found hidden among piles of fill which had been dumped systematically across a lot along South Huntington Avenue. One day we came upon two wild ducks floating in the center of this pond; on another occasion we flushed a pheasant out of the surrounding vegetation. Wildlife may be more plentiful on this lot than most others because of its proximity to the Muddy River.

On the pond's edges grow Willows, Cat-tails, Sedges, and — in mid-summer — a bright array of wildflowers, such as Loosestrife, Tansy, and Queen Anne's Lace.

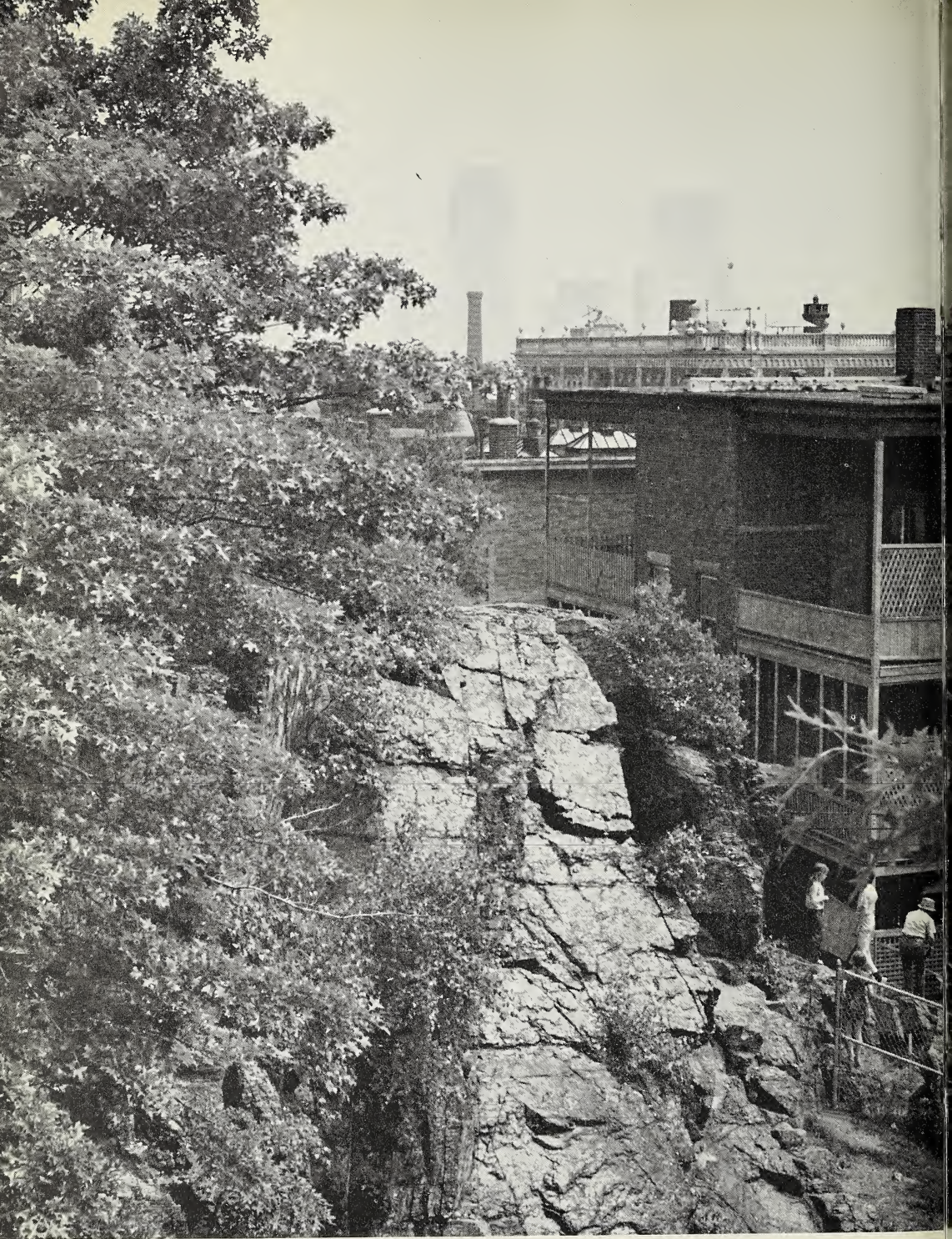




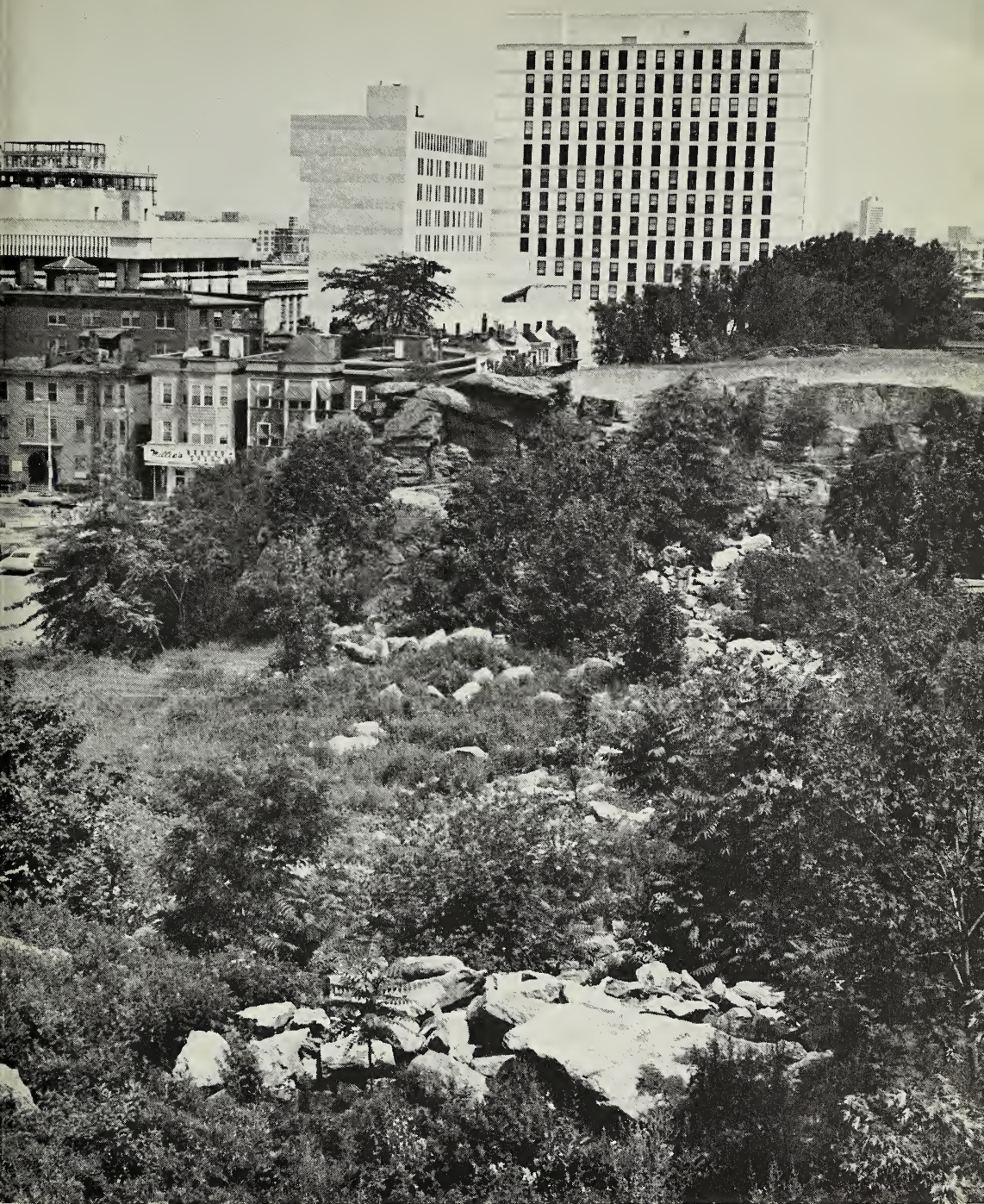


From the road this waterfront area looks like an abandoned parking lot; but as one approaches the back of the site, small ponds (such as this one rimmed by Cat-tails and beautiful Grasses) appear in shallow depressions.

A miniature meadow, created by a weedy planter in Copley Square, stands in strange juxtaposition to the urban surroundings. The planter was dominated by Clover, Yellow Wood Sorrel, and Horsetweed, but we collected 30 different kinds of plants from this site. Shortly after this photograph was taken, the weeds were removed and a cover of sod laid down, producing a neater, but less interesting, landscape.



These spectacular cliffs are one of the finest natural features of Boston now in private hands, and they should be carefully preserved. They form an outcrop along one side of Mission Hill, known as "The Ledge." Looking across the old quarry which lies on one side of The Ledge, one sees the startling juxtaposition of natural and man-made landscapes pictured at right.



In the quarry grow trees of many kinds, such as the Tree of Heaven, Norway and Sycamore Maples, Black Locust, Oaks, Poplars, and Ashes. Pin Oaks and Gray Birches (and even occasional ferns) grow out of the crevices in the cliffs. On the rim above the cliffs are a few Black Cherries, a Red Maple or two, and a large, rather flat field covered with flowers of many different kinds.



How to Use This Handbook

This handbook should be useful in identifying plants in cities throughout the northeastern United States, even though our observations were made almost entirely in Boston. We have not attempted to include all of the wild plants that we encountered. Rather, we have selected those which are most common and/or conspicuous, as well as some which are of unusual interest for one reason or another. Each plant included is represented by one or more illustrations. Identifying features such as height and leaf dimensions, and pertinent facts such as habitat and area of origin are included in the text accompanying the illustrations.

The plants are divided into four categories:

Herbaceous Flowering Plants	Trees and Shrubs
Grasses and Grasslike Plants	Ferns

The plants in the first category, being by far the most numerous, are again subdivided according to the color of their flowers, the categories being:

white	magenta	orange
pink	blue	greenish
purple	yellow	inconspicuous

To find a particular plant, simply flip through the pertinent category, using the illustrations as a means of identification.

To further aid in the identification of the herbaceous flowering plants, the following "key" may be used. This key consists of a series of diagrams showing generalized leaf shapes, and these are divided into eight main groups. The individual groups consist of one to five leaf types, representing variation within each of these groups. When identifying an unknown plant, first try to decide into which of the eight groups its leaves *best* fit. Remember that the diagrams are not meant to look *exactly* like actual leaves, but only to give general impressions of the leaf shapes.

The plants within each leaf-shape group are further subdivided according to flower color. Especially with the larger groups, this key will not lead to a specific identification; but it will help to narrow down the choices. It still will be necessary to look through at least a portion of the guide.

Along Washington Street one sees this example of pioneering vegetation squeezing through the cracks and crevices of an entirely paved site. The largest trees are Lombardy Poplars which were 15 or 20 feet tall when this photograph was taken in 1973. There also was a mature Quaking Aspen, as well as smaller saplings of the Tree of Heaven, Norway Maple, and Lombardy Poplar.



White, pink, purple, or yellow flowers
Clovers, pages 156, 157, 173

White or yellow flowers
Sweet Clovers, page 156

Yellow flowers
Wood Sorrel, page 188



Yellow flowers
Buttercups, page 184

Greenish or inconspicuous flowers
Beggar-ticks, page 205



White flowers
Ox-eye Daisy, page 163

Yellow flowers
Celandine, page 186
Winter Cress, page 191
Sow-thistle, page 196

Greenish or inconspicuous flowers
Pineapple-weed, page 204
Ragweed, page 206
Mugwort, page 207



White or pink flowers
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Chickweed, page 160
White Campion, page 161
Bladder Campion, page 162
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Smartweeds, page 169
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Mullein, page 193
Evening Primrose, page 194
Goldenrods, page 195
Hawkweed, page 198
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Blue, purple, or magenta flowers
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Nightshade, page 174
Burdock, page 176
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Dayflower, page 182

Wild Lettuce, page 197
Dandelion, page 199

Blue, purple, or magenta flowers
Thistle, page 178
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Inconspicuous flowers
Shepherd's Purse, page 214



White or pink flowers
Bindweed, page 152
Arrowhead, page 158



White flowers
Queen Anne's Lace, page 153
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Yellow flowers
Buttercups, page 184
Tansy, page 202

Greenish or inconspicuous flowers
Lamb's Quarters, page 209
Curly Dock, page 210
Plantains, page 212
Pokeweed, page 213
Peppergrass, page 215



White or purple flowers
Asters, page 164

Yellow or orange flowers
Yellow Iris, page 183
Butter and Eggs, page 192

Inconspicuous flowers
Horseweed, page 208



White or pink flowers
Hollyhock, page 167

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Herbaceous Flowering Plants



Field Bindweed — *Convolvulus arvensis*



Naturalized from Europe

HEIGHT: trailing or twining stems, 1-3 feet long.

LEAVES: 1-2 inches long.

FLOWERS: white or pale pink, 1-2 inches across. June to July.

Trailing along the ground of building lots and old fields, the Field Bindweed with its lovely trumpet-shaped flowers can be a most charming sight. But Field Bindweed tends to be more renowned for its aggression than for its flowers, because this is a particularly troublesome vine in cultivated fields and gardens throughout the United States.

It may take 20 to 30 cultivations to eradicate Bindweed from a field. Its roots are capable of penetrating soil up to 20 feet deep, and new plants are formed along a creeping, perennial root system that may spread over an area as large as 30 square yards in a single season. Bindweed also reproduces freely from seeds. It is particularly persistent in rich, heavy soil on the alkaline side.

Morning-glory Family (Convolvulaceae)

Queen Anne's Lace — *Daucus carota*



Naturalized from Europe

HEIGHT: up to 3 feet.

LEAVES: feathery, finely cut.

FLOWERS: white, in conspicuous flat clusters 3-4 inches across. July to September.

This wild relative of the domesticated carrot thrives in almost any sunny, well-drained soil, and it often provides a startling contrast to its bleak surroundings, for it is one of the most elegant plants to appear in Boston fields and building lots. Apparently Queen Anne's Lace came to the United States with early settlers, since it was already present in New England by the seventeenth century. Today its delicate foliage and large, umbrella-shaped, white flower clusters are a familiar sight in old dry fields and waste places throughout North America.

In the first year of growth this biennial produces a stout taproot and a low rosette of parsley-like foliage, followed the second year by a flowering stalk which may reach 3 feet tall. After flowering and producing its lightweight seeds, which are easily dispersed by wind, the plant dies.

Parsley Family (Umbelliferae)

Yarrow — *Achillea millefolium*



Native to the United States and most parts of the world

HEIGHT: up to 1-2 feet.

LEAVES: 1-10 inches long, deep green, lacy-textured, strongly-scented.

FLOWERS: whitish heads, in flat clusters 2-3 inches across. June to September.

All summer long, Yarrow's decorative, flat clusters of tiny white flower heads and lacy, dark green leaves are a familiar sight in Boston lots and grassy fields, as they are in sunny meadows, lawns, pastures and waste places throughout much of the world. As perennials, the plants spread by seeds and horizontal rootstocks. The first year plants, evident as low rosettes of lacy, fernlike leaves, are perhaps as familiar as the mature ones.

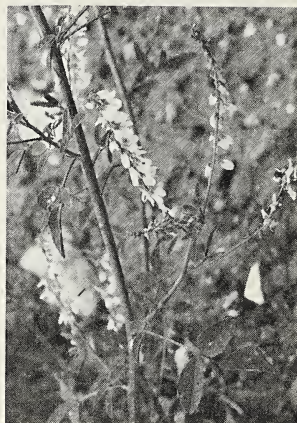
Yarrow is an herb of ancient medicinal repute. It reportedly has been used for stopping bleeding and healing wounds, and for relieving inflammations and toothache, and even for preventing baldness. According to legend, its powers to heal were first discovered by Achilles, who used it on his soldiers' wounds in the Trojan War.

Yarrow was grown in Colonial days as a medicinal herb, and it is lovely enough to be included still in purely decorative flower gardens today. It has been grown with Thyme, Clover, and Camomile in mixed lawns in Europe, as it is more drought resistant than grasses, and its rich color and dense texture contribute to the appearance of such lawns.

Sunflower Family (Compositae)



Sweet Clover — *Melilotus alba*



Naturalized from Europe

HEIGHT: up to 6 feet.

LEAVES: dark green, divided into 3 narrow leaflets $\frac{1}{2}$ -2 inches long.

FLOWERS: fragrant, white, $\frac{1}{4}$ - $\frac{1}{2}$ inch long, in narrow, slightly curving spikes. June to October.

This tall, bushy plant is one of the largest herbaceous weeds growing in Boston lots. It is common on porous soil throughout the United States and sometimes is cultivated as a "green manure" or cover crop, as is the Red Clover.

Sweet Clover's popular name is derived from the honey-like fragrance of its flowers. The flowers are held in distinctive, long, curving spikes which are not conspicuous from a distance, but are attractive at close hand against the rich, dark green of its leaves.

The plant is biennial. It reproduces by seeds which may lie dormant in the soil for many years and germinate when conditions eventually become favorable for growth.

The Yellow Sweet Clover (*Melilotus officinalis*), similar to the above species in most respects other than the color of the flowers, also is found in Boston's lots, but it is much less frequent.

Legume Family (Leguminosae)

White Clover — *Trifolium repens*

Naturalized from Europe

HEIGHT: creeping, only a few inches high.

LEAVES: dark green, divided into 3 rounded leaflets $\frac{1}{4}$ -1 inch long.

FLOWERS: white or rose-tinged, in dense, globose clusters $\frac{1}{2}$ -1 $\frac{1}{4}$ inches across. May to October.

One of the world's most widespread plants, this perennial often forms a beautiful, lush groundcover over the infertile soil of old building lots. Its ability to thrive on poor soil is largely due to its capacity to increase the supply of available nitrogen through the action of nitrogen-fixing bacteria associated with its roots. Since it actually improves the soil it grows on, especially after being turned under, White Clover is sometimes cultivated as a "green manure" or cover crop. In addition, the flowers are attractive to bees and make a very fine honey.

Its delicate, rich green leaves and white or rose-tinted flowers form an attractive, thick, rapidly spreading carpet; a solitary seedling can cover 10 square feet by the end of summer. All the plant seems to require to thrive is well-drained soil.

Legume Family (Leguminosae)

Arrowhead — *Sagittaria latifolia*



Native to the United States

HEIGHT: to 2 feet.

LEAVES: to 1 foot long and half as broad.

FLOWERS: about an inch across, with 3 white petals and a yellow center.
July to September.

Arrowheads are generally found in shallow water along the edges of lakes, ponds, or sluggish streams. In Boston they are most common in the Fens and along the Muddy River. The broad, arrowhead-shaped leaves originating from the base of the plant, and the dainty white flowers are not likely to be confused with those of any other wild plant in Boston.

In the autumn, Arrowheads produce potato-like tubers, an inch or two in diameter, at the ends of long, underground runners. These are eaten by ducks, muskrats, and other aquatic animals, and they formed an important item in the diets of many of the American Indian tribes. They are evidently quite good, either roasted or boiled.

Water-plantain Family (Alismataceae)

Galinsoga — *Galinsoga ciliata*



Naturalized from Tropical America

HEIGHT: to a foot, but usually shorter.

LEAVES: dull green, hairy, 1-3 inches long.

FLOWERS: in small, inconspicuous heads, about $\frac{1}{4}$ inch broad, with 5 short, white "petals" and a dirty-yellowish center. June to November.

A rather undistinguished-looking plant that does not have a local common name, Galinsoga is one of the very few weeds in our area that originated in Tropical America. It arrived in New England in the mid-1800's and is now widespread, being particularly abundant in gardens or other recently-cultivated soil. It has also appeared in several European countries.

Galinsoga is an annual, and produces seeds prolifically. The seeds attach easily onto clothing, doubtless aiding in dispersal of the plant.

Sunflower Family (Compositae)

Chickweed — *Stellaria media*



Naturalized from Europe

HEIGHT: more or less prostrate.

LEAVES: $\frac{1}{2}$ - $1\frac{1}{2}$ inches long.

FLOWERS: tiny white, $\frac{1}{4}$ inch across. February to December.



This rather fragile-looking plant is distinguished by its striking success throughout the world; it may be the most common weed on earth. It appeared in New England shortly after the first settlers arrived from Europe, and it now is established in lawns and grassland and the cultivated soils of gardens and fields throughout the United States. While it can grow in a wide variety of habitats, it is most aggressive when growing on rich, moist soil.

Part of Chickweed's success in spreading is due to its capacity to begin producing seeds — and hence a new generation — in little more than a month after its seeds have germinated. In addition, the blooming season is very long; in favorable spots the plant may bloom through the winter.

Despite its annoying aggression, Chickweed has useful features. Its young shoots may be eaten in salads or cooked as a vegetable, and its seeds are eaten by birds.

Pink Family (Caryophyllaceae)

White Campion — *Lychnis alba*

Naturalized from Europe

HEIGHT: up to 3 feet.

LEAVES: 1-3 inches long, slender, hairy.

FLOWERS: white or pale pink, 1 inch across, fragrant. June to August.

In midsummer this plant is often found blooming in open, grassy lots in Boston. The lovely, fragile flowers usually open in the evening and are closed by early the next day. They are pollinated by night-flying moths which are attracted by their fragrance and pale color.

White Campion grows most abundantly on rich, well-drained soil. It is common locally along roadsides and in grassland in the eastern, north-central and northwestern states. It is often seen in new seedings of grass, clover or alfalfa, for its seeds are abundantly produced and are a common impurity among the commercially available seeds of such plants. White Campion also spreads by forming new shoots along its underground rootstock.

Pink Family (Caryophyllaceae)

Bladder Campion — *Silene cucubalus*

Naturalized from Europe

HEIGHT: up to 2 feet.

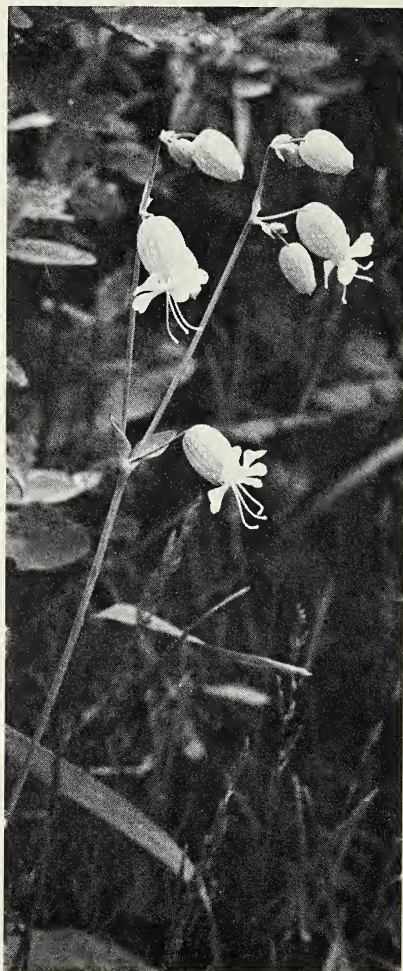
LEAVES: 1-3 inches long, smooth, gray-green.

FLOWERS: white, $\frac{1}{2}$ inch across.
June to September.

The smooth, gray-green stems and leaves of this delicate perennial easily distinguish it from the hairy White Campion (*Lychnis alba*), which has a similar flower.

Bladder Campion came to the United States from Europe. It spreads both by seeds and creeping perennial rootstocks, and it is often encountered in fields, meadows, and along roadsides in the north-eastern states. It also is seen locally in the Pacific Northwest.

Pink Family (Caryophyllaceae)



Ox-eye Daisy — *Chrysanthemum leucanthemum*



Naturalized from Europe

HEIGHT: up to 1-2 feet.

LEAVES: lower leaves 2-4 inches long, clustered into a low rosette; upper leaves narrower and clasping.

FLOWERS: large flowerheads 1-2 inches across, with white rays and a conspicuous yellow center. June to July.

Its bright flowers make an occasional conspicuous appearance in sunny fields and old building lots in Boston, but the Ox-eye Daisy does not grow as abundantly in Boston soil as one would expect from its performance in old fields, meadows, pastures and roadsides of more rural areas. It came to the United States with early settlers, and its presence in New England was noted by the seventeenth century. Today this plant has spread throughout most parts of the country. Its seed production is abundant, and the seeds may lie buried for years yet still germinate. They also may pass unharmed through the digestive systems of animals, aiding in the plant's persistence and spread on grazing land.

Ox-eye Daisy has a history of medicinal use since classical times. The entire plant was used in a tea which was reputed to act as an anti-spasmodic, helpful for treating asthma, whooping cough and nerves.

The leaves of this plant have a tangy taste and are occasionally used in salads.

Sunflower Family (Compositae)

Asters — *Aster* spp.



Native to the United States

A. ericoides

HEIGHT: 6 inches-3 feet.

LEAVES: variable among the different species, from narrow and grass-like to broad and heart-shaped, usually with toothed edges.

FLOWERS: daisy-like heads $\frac{1}{4}$ -1½ inches broad, with white, pink, or purple rays and a yellow or purplish center. August to November.

Along with the Goldenrods, Asters are among the most conspicuous late summer and fall-flowering plants in many parts of the United States. Many species, most of them native perennials, are found in a wide variety of habitats from rich woods to dry roadsides. Some of the species are attractive enough to be cultivated in gardens, but they are less commonly grown in this country than in England, where they, or their hybrids, are known as Michaelmas Daisies.

Several species are found in Boston. Perhaps the most common is the Heath Aster (*Aster ericoides*), a weedy plant with long arching branches nearly covered with small white heads in season. The Heart-leaved Aster (*Aster divaricatus*), with few, relatively large, white heads per plant, is occasional in wooded areas of the Fens and along the Muddy River. Several species with purple flowers sometimes are encountered in a variety of habitats, from wet areas to dry, sunny lots.

Sunflower Family (Compositae)

Daisy Fleabane — *Erigeron annuus*



Native to the United States

HEIGHT: 1-2 feet.

LEAVES: hairy, coarsely-toothed, the lower ones to 6 inches long, the stem leaves shorter.

FLOWERS: daisy-like heads about $\frac{1}{2}$ inch across with many, slender white to pink rays and a yellow center. June to September.

This rather coarse annual weed is found in many parts of the world, but it is a native in this country. It is a particular pest in hayfields across the United States, and seed-bearing plants are often transported in bales of hay. The seeds are a common impurity of grass seed. In Boston it is most common in sunny, grassy lots.

The flower heads of Daisy Fleabane are quite attractive. They are similar to those of many of our Asters, but the plants should not be confused since Asters generally bloom late in the season. The leaves of this or related species, when dried and made into a powder, were supposedly good for getting rid of fleas; hence the common name "Fleabane."

Sunflower Family (Compositae)

Japanese Knotweed — *Polygonum cuspidatum*

Naturalized from Japan

HEIGHT: up to 8 feet.

LEAVES: dark green, 3-6 inches long.

FLOWERS: small, creamy-white, in showy clusters about 4-5 inches long. August to September.

This is a striking plant when it is in full bloom in late summer. But under the frothy cascade of flowers lies an amazingly aggressive plant. It spreads rapidly from long underground rhizomes, forming large clumps which are difficult to eradicate; the shoots are even capable of emerging through a layer of asphalt.

Japanese Knotweed was originally introduced into the United States as an exotic garden plant, but it has escaped from cultivation and has spread aggressively throughout the northeastern region. In Boston it grows abundantly in rather rich, damp soil, such as that of parks and gardens, and it is particularly well-established along the moist banks of the Muddy River.

Cooked for a few minutes, its young stems (up to 1 foot long) are edible and apparently quite delicious.

Buckwheat Family (Polygonaceae)



Hollyhock — *Althaea rosea*



Escaped from cultivation

HEIGHT: 4-8 feet.

LEAVES: roundish, but with a scalloped or lobed margin, to 10 inches broad, with a long stalk.

FLOWERS: showy, 3-4 inches broad, with 5 pink or white petals. July to September.

Hollyhocks are among the few of our garden plants that have become established in the wild in Boston. We have seen them in a number of locations, and they seem to do well even in grassy lots.

Hollyhocks are native to China, but they were cultivated in England as early as 1593. They were grown in this country before 1700. Many garden forms have appeared, with single or double flowers from white through yellow to pink and red. However, as is the case with many garden plants, only those forms resembling the wild plants do well as escapes; wild forms of Hollyhocks have white or pink, single flowers.

Mallow Family (Malvaceae)

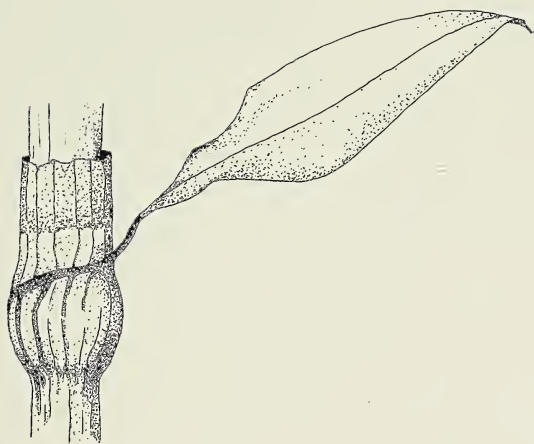


P. persicaria

P. punctatum

P. lapathifolium

Smartweeds — *Polygonum* spp.



Detail of a node

Some introduced from Europe; others native to the United States

HEIGHT: up to 2 feet, erect or sprawling.

LEAVES: 1-8 inches long, often marked by a brown blotch near the center.

FLOWERS: small, white or pink, in usually dense, erect or drooping spikes ½-3 inches long. May to October.

One of the several species of Smartweed can be found growing in most every situation in Boston, from unweeded planters and sidewalk cracks to vacant lots. Almost all are annual weeds, and their seeds are eaten and dispersed by birds. Smartweeds are members of the Knotweed group, and although they are different in appearance from the others already discussed, they all share one common characteristic: the nodes of the stem (where the leaves are attached) are swollen and surrounded by a papery sheath, resembling knots on a string. This is the origin of the common name, "Knotweed."

A few species of Smartweed have leaves with a brown blotch, resembling a thumbprint, near the center. These sometimes are called "Lady's Thumb."

Buckwheat Family (Polygonaceae)

Bouncing Bet — *Saponaria officinalis*



Naturalized from Europe

HEIGHT: up to 2 feet.

LEAVES: 1-3 inches long.

FLOWERS: to 1 inch across, fragrant, pink. July to September.

Throughout the summer the flowers of this ornamental perennial are conspicuous along fences, walls, garden edges and in old vacant lots in Boston.

Bouncing Bet arrived in New England with settlers from Europe in the seventeenth century. It has spread aggressively by seeds and perennial rootstocks, and today it is found in damp soil along roadsides and railroad tracks, and in old fields and pastures throughout the eastern United States. A double-flowered form is more common than the single-flowered in many areas but we did not see it in Boston.

Bruised in water, the stems and leaves of Bouncing Bet emit a juice which makes a lather once considered an excellent substitute for soap in cleaning particularly delicate fabrics and china. The plant also has been used as an antiseptic for treating wounds, and it has a reputation for being effective in relieving the itching of Poison Ivy.



Pink Family (Caryophyllaceae)

Common Milkweed — *Asclepias syriaca*



Native to the United States

HEIGHT: 2-5 feet.

LEAVES: 4-9 inches long, pale and downy on the underside.

FLOWERS: dull pinkish-purple, in rounded clusters 2-3 inches across, fragrant. June to August.

The Milkweed's plumed seeds are its trademark. In September when the ripe pods split open, masses of light, silky seeds take to the air, floating on the slightest breeze.

Milkweed forms large colonies in rich gravelly soil in old fields and waste places of the eastern United States. Usually it is found growing in patches, because the plant is perennial and spreads not only by seeds but also by horizontal root-stocks, along which new plants arise.

The tender young shoots, leaves, and even flower buds and seed pods of Milkweed are edible, and provide good greens if their bitterness is removed in several changes of water during cooking. Indians used its roots, juices, and seeds medicinally, and made string and rope out of its fibers. Although Common Milkweed is perhaps too invasive a grower to be recommended for gardens, the flowers are attractive and sweet-scented.

Milkweed Family (Asclepiadaceae)

Red Clover — *Trifolium pratense*



Naturalized from Europe

HEIGHT: up to 2 feet.

LEAVES: divided into 3 rounded leaflets $1\frac{1}{4}$ - $2\frac{1}{2}$ inches long, each marked by a distinctive light band.

FLOWERS: pink to magenta, in dense globose clusters, $1\frac{1}{2}$ inches across. May to October.

This plant grows in lush clumps on the poor soil of old building lots. Like White Clover, Vetch and other leguminous plants, it is sometimes cultivated as a "green manure" or cover crop.

Red Clover is easily distinguished from other Clovers by its large pink or magenta-colored flower clusters and the distinctive light bands which appear on each leaflet. It came to North America shortly after the first settlers arrived from Europe. It may have been introduced intentionally as a cover crop, since it was highly thought of by the English as a soil conditioner.

Legume Family (Leguminosae)

Nightshade — *Solanum* spp.



S. dulcamara

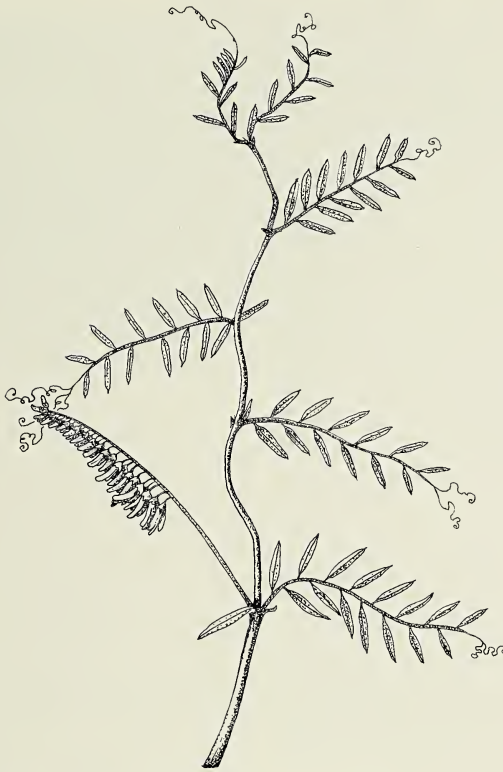
Naturalized from Europe

Two nightshades are encountered in Boston. The annual Black Nightshade (*Solanum nigrum*) is distinguished by its white flowers and small, shiny black berries, and it is partial to fields and shady sites. The perennial Deadly Nightshade (*Solanum dulcamara*) is an herbaceous vine which favors rich, damp soil, and bears violet-blue flowers and shiny red berries.

The berries of both plants are poisonous, causing extreme nausea and cramps if eaten. However, the severity of their effects seems to vary considerably. The berries of Black Nightshade have been used in baking, but it would seem wisest not to eat any part of either plant.

Nightshade Family (Solanaceae)

Vetch — *Vicia cracca*



Naturalized from Europe

HEIGHT: climbing or trailing stems,
1-3 feet long.

LEAVES: rows of tiny, narrow leaf-
lets $\frac{1}{2}$ -1 inch long.

FLOWERS: blue-purple, 1 inch long.
June to August.

This plant has an interesting mechanical method of seed dispersal, similar to that of the Yellow Wood Sorrel and Jewelweed: when its ripe seed pods slit open, the seeds within are flung away from the parent plant.

Vetch has been cultivated in fields as a cover crop or "green manure" and sometimes as a forage plant. It also has been used on highway embankments and roadsides as a rapid-growing ground cover.

Legume Family (Leguminosae)

Burdock — *Arctium minus*



Naturalized from Europe

HEIGHT: up to 3-4 feet.

LEAVES: 10-18 inches long, about half as broad.

FLOWERS: pink, or occasionally purple, in dense, thistle-like flower heads $\frac{1}{2}$ inch across. July to October.

Inadvertently carried from Europe to the United States by early settlers, Burdock was already recorded in New England by the seventeenth century. Today it is widespread on rich soil in waste places and neglected farm yards throughout the United States, and its large, rather dull, green leaves are conspicuous in many Boston lots.

During the first year of growth, a distinctive 1-2 foot rosette of large leaves and a thick taproot are produced, followed the second year by a flowering stalk which reaches 3 to 4 feet in height. After flowering and producing the familiar prickly burrs which cling

to the coats of passing animals and humans, each plant usually dies, for the Burdock is a biennial.

The first-year roots, young leaves and peeled young flower stalks all are edible, and Burdock has been so valued as a food plant in Japan that a special garden variety has been developed. The plant has been used medicinally since ancient times. It was believed that its roots would draw out the poison of vipers, or cure eczema and toothache.

Sunflower Family (Compositae)



Bull-thistle — *Cirsium vulgare*



Naturalized from Europe

HEIGHT: 3-6 feet.

LEAVES: coarsely and irregularly lobed, the teeth tipped with sharp spines; lower leaves to a foot or more long, the upper ones smaller.

FLOWERS: medium purple, in heads 1-3 inches broad and very prickly at the base. June to September.

Anyone who has tried to get close enough to a Bull-thistle to admire its attractive flower heads, let alone pick them, is well aware of the vicious spines so characteristic of the stems and leaves of this plant. It is conspicuous in pastures, fields, roadsides and other open places throughout the United States. Being a biennial, a first year plant appears as a broad rosette of spiny leaves. Flowering occurs the second year, and then the plant dies. The seed head resembles that of a Dandelion, only denser and much larger, and the light seeds are dispersed by the wind.

Sunflower Family (Compositae)

Purple Loosestrife — *Lythrum salicaria*



Naturalized from Europe

HEIGHT: 3-6 feet.

LEAVES: slender, 2-5 inches long.

FLOWERS: magenta, about $\frac{1}{2}$ inch across, in dense, slender spikes. July to August.

This very showy plant is abundant in marshy or other wet places throughout the northeastern United States. In mid- to late summer it turns acres of such areas into sheets of magenta. It is particularly conspicuous along Route 1 in Dedham and along Route 128 south of Boston. Although most characteristic of wet areas, it does appear here and there in dry lots in Boston, but usually only in scattered instances.

A native of Europe, Purple Loosestrife is gradually extending its range in North America. This perennial produces large quantities of light, easily windblown seeds. It has become rather a serious pest in New England because it chokes out the native vegetation in places where it has become established.

Loosestrife Family (Lythraceae)

Viper's Bugloss — *Echium vulgare*

Naturalized from Europe



HEIGHT: 1-2½ feet.

LEAVES: 2-6 inches long, hairy.

FLOWERS: bright blue, ½-1 inch long, in short curving clusters on a loose spike. June to July.

In Boston the lovely bright blue funnel-shaped blossoms of Viper's Bugloss are a welcome sight when they appear in early summer, but in the fields and pastures of more rural areas this plant can be a persistent and troublesome weed. It is so despised in Australia that it is known as "Paterson's Curse," after the unfortunate settler who introduced it to that country.

Viper's Bugloss arrived in New England from Europe by the seventeenth century. Today it is widespread in dry, gravelly fields, meadows and roadsides throughout the eastern United States.

A biennial, this plant produces a stout taproot and rosette of leaves in the first year, followed by a flowering stalk the next. Viper's Bugloss is a difficult plant to eradicate because it easily regenerates if any portion of the deep taproot is left in the ground.

Viper's Bugloss was reputed to be effective against poisonous snake bites, either made into a drink, or chewed and laid directly on the bite.

Borage Family (Boraginaceae)

Chicory — *Cichorium intybus*



Naturalized from Europe

HEIGHT: 1½-5 feet.

LEAVES: lower leaves 4-8 inches long, clustered in a flat, evergreen rosette; upper leaves small and clasping.

FLOWERS: Bright blue, or rarely pink or white, daisy-like flowerheads, 1-1½ inches across. June to August.

In midsummer Chicory's distinctive blue, daisy-like flowers and stiff, almost leafless stems are conspicuous in Boston's fields and old building lots.

Chicory was originally brought to the United States by early settlers, who cultivated it in their gardens as a food plant. Today it ranges through old fields and roadsides in most parts of the country. It is particularly persistent in light, sandy, somewhat alkaline soil.

Chicory has long been a popular vegetable and salad plant. Its large basal leaves are cooked for greens, or blanched and used in salads. Its roots are boiled and served with butter, or roasted and used as a coffee substitute or additive. The plant also has been used medicinally for several disorders. It was said to be useful for jaundice and to be comforting for a weak stomach.

Sunflower Family (Compositae)

Dayflower — *Commelina communis*



Naturalized from Asia

HEIGHT: usually less than a foot; creeping.

LEAVES: smooth and lustrous, 1-2 inches long.

FLOWERS: bright blue, $\frac{1}{2}$ inch across. July to September.

Since most of the New World's early contacts, both in commerce and immigration, were with Europe, the great majority of its introduced weeds have come from that continent. Asiatic weeds are rare here, but the Dayflower is one which has become well-established. An annual species, it prefers soils richer and moister than those found in most building lots. In Boston, at least, it is most common in gardens.

The curious flowers, with two of the petals bright blue and conspicuous, and the third one tiny and greenish, open only in bright light. This, plus the fact that they last only a single day, accounts for the plant's common name. The creeping, lustrous green foliage resembles that of the "Wandering Jew," a common house plant and a close relative of the Dayflower.

Spiderwort Family (Commelinaceae)

Yellow Iris — *Iris pseudacorus*

Naturalized from Europe

HEIGHT: 2-4 feet.

LEAVES: very slender, to 3 or rarely 4 feet long and less than 1½ inches broad, gray-green.

FLOWERS: showy, bright yellow, 3 or 4 inches broad. June.



This beautiful plant was brought to America as a garden plant sometime before 1700 and has since escaped to the wild. It is common in wet areas, particularly at the edges of ponds and streams, throughout much of the eastern United States. In Boston it is most abundant in the Fens and along the Charles and Muddy Rivers.

This, and many other species of Iris, grow from thick rhizomes or rootstocks which lie just below the surface of the ground. These rhizomes may cause dermatitis if broken and brought into contact with human skin. The Yellow Iris produces abundant seeds, accounting for its ability to spread rapidly in the wild.

Iris Family (Iridaceae)

Buttercups — *Ranunculus* spp.



R. acris

Some native to the United States, others naturalized from Europe.

HEIGHT: to 3 feet.

LEAVES: deeply lobed, often with silvery markings on the upper surface.

FLOWERS: showy, about 1 inch across, with 5 shiny, bright yellow petals. April to August.

Several species of Buttercups are found in Boston, but two in particular, both naturalized from Europe, are common and conspicuous. The Bulbous Buttercup (*Ranunculus bulbosus*) is a low plant (seldom more than 18 inches tall) that is common in lawns, gardens and other cultivated places as well as in sidewalk cracks. The leaves are often silver-spotted on their upper surface. The Common Buttercup (*Ranunculus acris*) is a taller plant, often nearly a yard tall, that is most common in grassy lots.

The stems and leaves of these perennials contain a substance which may irritate the mouth and stomach if eaten or cause blisters if rubbed on the skin. Cattle have died from eating them in quantity.

The Celandine (*Chelidonium majus*) is often mistaken for a Buttercup. The flowers of this plant, however, have only 4 petals, and they are dull-textured rather than shiny.

Crowfoot Family
(*Ranunculaceae*)

R. bulbosus



Celandine — *Chelidonium majus*



Naturalized from Europe

HEIGHT: up to 2-3 feet.

LEAVES: green with grayish undersides, irregularly cut into 5 parts.

FLOWERS: bright yellow, $\frac{1}{2}$ inch across. May to July.

The delicate, scalloped leaves and bright yellow flowers of Celandine are conspicuous along the rich, damp edges of Boston gardens. This plant was originally brought to the United States by New England settlers who valued it as a medicinal herb and grew it in their gardens. Today, it has spread to rich soil in farmyards, roadsides, gardens and woodland edges from the northeastern United States south to Georgia, Tennessee and Missouri.

A biennial, Celandine lives for two years only. In the first year of growth low tufts of foliage are produced, followed in the second year by the lovely flowering stalks.

The roots and yellow juice of Celandine have been said to cure a variety of ailments, ranging from ringworm and warts to "the itch." The juice, however, may produce skin irritation.

Poppy Family (Papaveraceae)



Yellow Wood Sorrel — *Oxalis stricta*



Native to the United States

HEIGHT: up to 10 inches, but most often low and somewhat creeping.

LEAVES: clover-like, separated into 3 leaflets, each to $\frac{1}{2}$ inch across.

FLOWERS: yellow, $\frac{1}{4}$ - $\frac{1}{2}$ inch across. May to September.

This plant is often mistaken for clover since its leaves are so similar in shape, but its small, five-petaled yellow flowers are distinctive.

In appearance, at least, Wood Sorrel is a rather charming plant. Close relatives with larger flowers are considered decorative enough to be cultivated in gardens and on windowsills. It is a native of the United States, and is often encountered in woods and dry fields throughout the country, but it grows most abundantly in the eastern states. Rather than thriving in the rigorous environment of most building lots, in Boston it is usually found growing in or near gardens where it is often quite a persistent weed.

Wood Sorrel has an interesting method of avoiding competition between the parent plant and its offspring. When a ripe pod splits open, its interior lining turns completely inside out, and thus explosively catapults the seeds some distance away.

Its foliage is rich in vitamin C and is sometimes used in salads; however, it should not be eaten in large quantities as the plant also has a high oxalic acid content and could be toxic.

Wood Sorrel Family (Oxalidaceae)

Purslane — *Portulaca oleracea*



Naturalized from Europe

HEIGHT: sprawling, fleshy stems, up to 12 inches long.

LEAVES: fleshy, often tinged reddish, $\frac{1}{2}$ -1 $\frac{1}{2}$ inches long.

FLOWERS: inconspicuous, pale yellow, $\frac{1}{4}$ inch across, opening only in bright sunlight. July to September.

Purslane grows almost all over the world. It is a hot weather plant, springing up on bare soil in local fields and gardens from June onward. It grows only on cultivated soil, and is often very difficult to eradicate.

Purslane is an excellent and well-respected food plant which has been encouraged and cultivated since ancient times. The tips of its succulent young stems can be harvested periodically throughout the summer and cooked and seasoned like Spinach, or eaten raw in salads.

Other members of this genus are cultivated in gardens for their decorative flowers.

Purslane Family (Portulacaceae)

St. John's-wort — *Hypericum perforatum*

Naturalized from Europe

HEIGHT: 1-3 feet.

LEAVES: $\frac{1}{2}$ -1 inch long, pale green.

FLOWERS: golden yellow, $\frac{3}{4}$ -1 inch broad, in clusters. July and August.

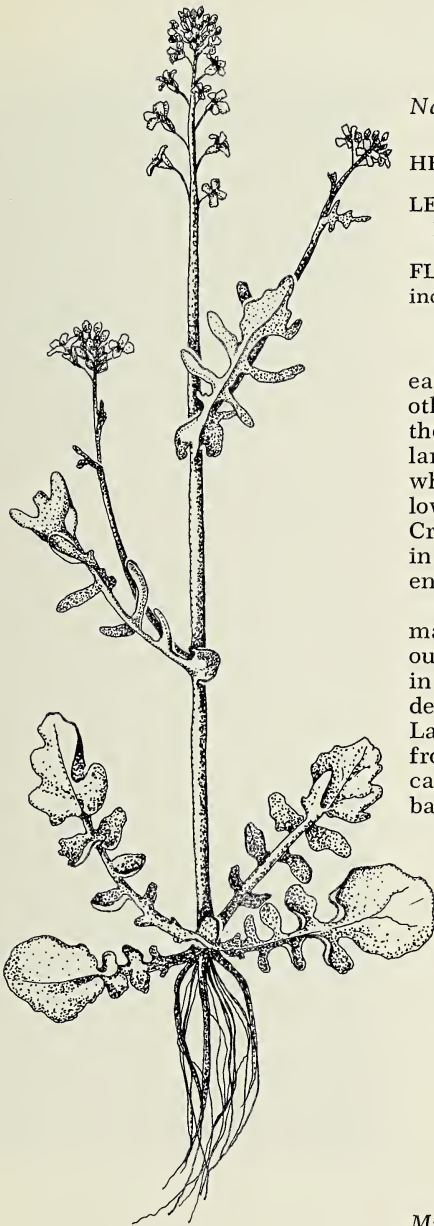
In midsummer, clusters of the bright, golden-yellow flowers of St. John's-wort make a conspicuous appearance in grassy fields and old building lots in Boston.

This familiar perennial has a wide distribution throughout many parts of the world. Its seeds are a common impurity in grass seed, and have been most likely scattered from one part of the world to another in shipments of hay. This plant came to New England with the early settlers, and has since spread through much of temperate North America. It prospers on dry, gravelly soil, and it is a difficult plant to suppress, for it spreads vigorously from short runners. It also produces seeds prolifically, perhaps as many as 30,000 per plant in a single season. The seeds are easily carried off by the wind, and they are so light that St. John's-wort even has been found growing in the steeples of old churches.

St. John's-wort was listed in the early herbals as useful to stop bleeding, cure burns, heal ulcers, or as a laxative. A bit of the plant was supposed to provide protection against witchcraft and enchantment; also damage from storms, thunder, and evil spirits. It also has been used as a yellow dye for wool.



St. John's-wort Family
(*Hypericaceae*)

Winter Cress — *Barbarea* spp.

Naturalized from Europe

HEIGHT: to 2 feet tall.

LEAVES: deep glossy green, deeply lobed, 2-6 inches long.

FLOWERS: bright yellow, about $\frac{1}{4}$ inch across.

Throughout many parts of the eastern United States, these and other yellow-flowered members of the Mustard family are particularly conspicuous in the spring when they turn fallow fields yellow with their blooms. Winter Cress is not particularly common in Boston, but it is occasionally encountered in open, sunny lots.

The leaves of Winter Cress remain green and succulent throughout the winter and, when boiled in two changes of water, are evidently quite good as greens. The Latin name *Barbarea* was derived from the fact that these plants can be eaten as early as St. Barbara's Day in early December.

Mustard Family (Cruciferae)

Butter and Eggs — *Linaria vulgaris*

Naturalized from Europe

HEIGHT: up to 1-2 feet.

LEAVES: 1-2 inches long, about $\frac{1}{8}$ inch wide; gray-green.

FLOWERS: pale yellow and orange; about 1 inch long. June to October.

The delicate yellow and orange Snapdragon-like flowers and the narrow gray-green foliage of this rugged perennial appear in sidewalk crevices and open, sunny lots throughout Boston. Butter and Eggs was introduced to New England by the seventeenth century. Today it grows profusely along roadsides and waste places throughout much of the United States. While seed production is apt to be poor without cross-pollination, the shoot production of this plant is abundant: over one hundred shoots may be produced by a typical two-year-old plant!

Butter and Eggs derives its popular name from the color of its flowers: butter yellow with a blotch nearly the color of the yolk of a fresh egg.

The early herbalists listed this plant as useful in treating a variety of disorders, ranging from skin eruptions to jaundice and ulcers.

Figwort Family
(*Scrophulariaceae*)



Mullein — *Verbascum thapsus*

Naturalized from Europe

HEIGHT: up to 7 feet.

LEAVES: light green, woolly; lower leaves 4-12 inches long, in a rosette 8-24 inches across; upper leaves smaller.

FLOWERS: bright sulphur yellow, $\frac{1}{2}$ inch across in a narrow dense cylindrical spike, but only a few open at any given time. June to September.

Even from quite a distance one can easily spot Mullein's rosette of large, soft, fuzzy, pale green leaves, and its thin, cylindrical flower spike, which often reaches up to 7 feet or so in height.

This biennial produces massive amounts of seeds, but it is not an invasive plant, and it cannot tolerate crowding. It grows on dry, stony soils in old fields and meadows and along roadsides throughout the United States. It may have been intentionally imported into New England as a garden plant, for it has a long reputation as a good medicinal herb.

Mullein has been found useful for quite a variety of other purposes as well. Over the years its leaves have provided a soft lining in shoes; dried and floated in oil, they are serviceable lamp wicks. Its long stalks have been coated with fat to serve as tall candles.

Figwort Family
(*Scrophulariaceae*)

Evening Primrose — *Oenothera biennis*

Native to the United States

HEIGHT: 2-6 feet, with reddish stems.

LEAVES: 3-6 inches long, hairy.

FLOWERS: pale yellow, about 1 inch across, fragrant. June to September.

The Evening Primrose is one of our native weeds, and it is a common plant of fields and roadsides throughout the eastern and central United States. During the summer it occasionally forms large colonies on dry, sunny sites in Boston.

This plant is distinguished by its tall, erect, reddish stems and its pale yellow flowers. Its blossoms usually open at dusk, when they emit a soft fragrance, and close by early the next day; thus, the origin of the common name.

Being biennials, the first year plants appear merely as rosettes of rough-hairy leaves. At this stage, the thick, fleshy taproots are palatable, if cooked in two changes of water and if collected at the right time during the winter months. Otherwise they are too peppery to appeal to most people.

Evening Primrose Family
(*Onagraceae*)



Goldenrods — *Solidago* spp.

Native to the United States

HEIGHT: 1-5 feet.

LEAVES: variable among the different species, from narrow and grass-like to 3 inches broad, starting in a basal rosette.

FLOWERS: yellow heads $\frac{1}{8}$ - $\frac{1}{4}$ inch broad, in slender, pyramidal, or flat clusters. August to October.

From late summer until frost, the bright yellow flowers of Goldenrod are conspicuous in all sorts of habitats across the country, particularly in the eastern half. There are many different species, and even a botanist often has trouble identifying them. Several species are found in grassy fields and lots in Boston, but the Canada Goldenrod (*Solidago canadensis*), pictured here, is perhaps the most common.

Although generally thought of as a major cause of hay fever, most species of Goldenrod shed pollen in quantities too small to be significant. This erroneous notion probably arose because of the fact that these are among the most conspicuous plants during one of the worst hay fever seasons.

Sunflower Family (Compositae)

Sow Thistles — *Sonchus* spp.

Naturalized from Europe

HEIGHT: to 6 feet tall.

LEAVES: coarsely and irregularly lobed, the lower ones to a foot or more long, the upper ones smaller.

FLOWERS: yellow, Dandelion-like heads, 1-2 inches across; followed by fluffy seed heads, again like those of Dandelions. June to September.

Several species of Sow Thistle are found in grassy or gravelly lots in Boston, and we will make no attempt here to separate them. They all are coarse herbs that resemble the Wild Lettuce in many respects, including the presence of a milky juice in all parts of the plant. The flowers of the Sow Thistles are larger, however, and the leaves have spiny teeth all along their edges. These spiny teeth resemble those of Thistles, but are not so stiff.

Most of these plants are annuals, but the Field Sow Thistle (*Sonchus arvensis*), is a perennial, and it spreads vigorously by a fast-growing underground rootstock. The leaves of the Common Sow Thistle (*Sonchus oleraceus*) are cooked as greens in Europe.



Sunflower Family (Compositae)

S. oleraceus

Wild Lettuce — *Lactuca scariola*

Naturalized from Europe

HEIGHT: 1-5 feet.

LEAVES: pale green, to 6 inches long, with a row of sharp prickles along the midvein on the underside.

FLOWERS: numerous yellow, Dandelion-like heads (only a few open at any one time) $\frac{1}{4}$ - $\frac{1}{2}$ inch across; followed by fluffy seed heads, again resembling those of Dandelions. July to October.



Although this plant is closely related to the cultivated Lettuce, the similarities are not particularly obvious to the casual observer. The leaves of the two plants are quite different, yet the flowers are nearly identical, although few gardeners ever get to see Lettuce flowers because they harvest the crop before the plants are old enough to produce them.

This coarse annual is common both in cultivated and in uncultivated ground throughout the United States. It is particularly troublesome if abundant in grain fields, because the milky juice present in all parts of the plant can clog threshing machines. The light seeds are dispersed by the wind, and are a common impurity of grain. These factors account for the plant's widespread distribution.

One curious habit of the Wild Lettuce, which may be useful for identification purposes, is that, when it is grown in the open, its leaves are oriented vertically. This is well illustrated in the accompanying photograph. When grown in the shade, the leaves are oriented horizontally as in most other plants.

Sunflower Family (Compositae)

Hawkweed — *Hieracium canadense*



Native to eastern United States

HEIGHT: to 5 feet.

LEAVES: hairy, irregularly toothed, dull, dark green; 2-6 inches long.

FLOWERS: bright yellow Dandelion-like heads $\frac{1}{2}$ -1 $\frac{1}{2}$ inches across.
August to October.

This attractive perennial is one of the most colorful of the late summer- and fall-flowering plants in Boston. It is most common in shady, wooded areas, where it forms dense stands that are conspicuous even when not in flower. Hawkweed is occasionally found in open, sunny lots, as indicated in the photograph above.

Many introduced species of Hawkweed are common weeds in the United States, but this is the only one that is frequently encountered in Boston. According to legend, hawks used the plants to improve their eyesight, hence the common name of the group.

Sunflower Family (Compositae)

Dandelion — *Taraxacum officinale*

Naturalized from Europe

HEIGHT: to 15 inches.

LEAVES: 3-12 inches long, irregularly lobed, in a basal rosette.

FLOWERS: golden-yellow flowerheads to 2 inches broad, opening only in sunny weather and closing at night. Mostly blooms April to June.

This scourge of suburban homeowners is basically a very attractive plant. However, few people stop to appreciate the beauty of the flowers as they are eradicating the plants from their lawns and gardens. The common name is a corruption of the French *dent de lion*, which means “lion’s tooth”, in reference to the plant’s jaggedly toothed leaves.

The first Dandelions appeared in New England shortly after the first settlers arrived from Europe. The plant’s deep, persistent root and light, widely dispersed seeds have helped it become established in fields, lawns, sidewalk cracks, and roadsides throughout the United States.

The Dandelion is a plant of many uses. Before a plant has flowered, the leaves are excellent, either raw in salads, or cooked like Spinach. Its flowers are used to make wine, and its roots and leaves are used to prepare a medicinal tea.

Sunflower Family (Compositae)

Black-eyed Susan — *Rudbeckia hirta*



Native to the United States

HEIGHT: up to 3 feet.

LEAVES: 2-6 inches long, hairy.

FLOWERS: orange-yellow flowerheads 2-4 inches across, with a dark purplish-brown center. June to August.

Travelling eastward in shipments of commercial seeds and hay, this striking native of the western prairies has gradually spread to New England fields, meadows and roadsides. It is now so well-established here that, like Queen Anne's Lace, it often is considered to be a native wildflower.

Its large, golden-yellow, daisy-like flowerheads with their dark purplish-brown centers are so attractive that Black-eyed Susan is often cultivated in gardens.

In the first year of growth this biennial appears as a rosette of slender, hairy, green leaves. The second year, showy flowering stalks appear and, after producing seeds, the plant dies.

Sunflower Family (Compositae)



Tansy — *Tanacetum vulgare*



Naturalized from Europe

HEIGHT: up to 3 feet.

LEAVES: up to 1 foot long, deep green, fernlike, extremely aromatic.

FLOWERS: golden-yellow, button-like heads $\frac{1}{4}$ - $\frac{1}{2}$ inch across or less, in flat-topped clusters. July to September.

Tansy is one of the most appealing of the very common weeds in Boston. Its aromatic, rich green foliage, and its midsummer clusters of distinctive, golden flowers form a splendid cover for the dry, gravelly soil of many old building lots.

Tansy was brought to the United States from Europe as a garden plant, grown for its decorative qualities and its supposed medicinal uses. It has been used in quite a variety of ways: to preserve meat and corpses; to repel insects; as a tea to dispel worms and relieve nausea; and in poultices to relieve rheumatism and gout. Its leaves also are used occasionally in salads as a flavoring.

It is a perennial weed and often grows in dense colonies formed by its creeping rootstocks.

Sunflower Family (Compositae)

Jewelweed, Touch-me-not — *Impatiens capensis*



Native to northeastern United States

HEIGHT: 1½-5 feet.

LEAVES: 2-5 inches long, bluish-green.

FLOWERS: orange, or occasionally yellow, speckled with brown or crimson, 1 inch long. June to September

The delicate orange (or yellow) flowers and bluish-green leaves of this lovely New England native are conspicuous in a few damp places in Boston, particularly along the unmowed banks of the Muddy River.

One of the popular names of this plant — “Touch-me-not” — alludes to the sudden way in which its ripe seed capsules burst when they are touched, flinging the seeds to distances of 6 feet or so. The seeds float and are often carried to new locations by running water.

According to tradition, the juice of Jewelweed brings immediate relief from the itching of Poison Ivy and Nettles.

Balsam Family (Balsaminaceae)

Pineapple Weed — *Matricaria matricarioides*



Native to western United States

HEIGHT: 3-12 inches.

LEAVES: to 2 inches long with a delicate, fernlike texture, and a scent resembling pineapples.

FLOWERS: inconspicuous, greenish-yellow, in dense flowerheads $\frac{1}{4}$ - $\frac{1}{2}$ inch across. May to September.

A rugged, low-growing little annual with aromatic leaves, this plant has spread from its native habitat on the Pacific Coast to old fields and roadsides in the eastern states and on to Europe. It is capable of growing on extremely poor, packed down soil, and is often seen in Boston growing on sites such as dirt paths and the bare patches of playing fields.

Sunflower Family (Compositae)

Beggar-ticks — *Bidens frondosa*



Native to the United States

HEIGHT: up to 5 feet.

LEAVES: 2-5 inches long, dull, dark green leaflets, 3 to 5 per leaf.

FLOWERS: inconspicuous, dull orange-yellow, in heads $\frac{1}{2}$ inch across.
August to September.

A tall, drab-looking plant with purplish stems and dull green leaves, Beggar-ticks seems to prosper particularly in the moist soil of Boston gardens, although it does appear even on our driest lots.

Beggar-ticks is native to the United States, and is common in pastures, roadsides, gardens, cultivated fields and waste places across the country. Its seeds are widely distributed, because they are armed with two barbed projections which catch easily on fur and clothing, thus the origin of the generic name "*Bidens*", meaning "two teeth."

Sunflower Family (Compositae)

Ragweed — *Ambrosia artemisiifolia*



Native to the United States

HEIGHT: 1-4 feet.

LEAVES: 2-4 inches long, with a lacy texture.

FLOWERS: inconspicuous, yellowish-green, in dense slender spikes 2-3 inches long. August to September.

An infamous cause of hay fever when its pollen is in the air in late summer, Ragweed is probably one of the most widely detested weeds growing in the United States. It is common to cultivated fields, meadows, pastures and waste places throughout the United States, but it is particularly abundant in the eastern and north central states. Due to its copious seed production and the longevity of its seeds, it is a difficult plant to eradicate once it has been allowed to flower.

While Ragweed does grow on dry, sunny soil in Boston lots, its incidence here is probably greatly overestimated since it closely resembles the more pervasive Mugwort.

Sunflower Family (Compositae)

Mugwort — *Artemisia vulgaris*



Naturalized from Europe; possibly native to the western United States as well

HEIGHT: 1-6 feet.

LEAVES: 1-4 inches long, silvery on undersides, strongly aromatic.

FLOWERS: inconspicuous greenish-white heads $\frac{1}{16}$ inch across, in long, slender clusters. July to September.

The coarse reddish stems and lacy foliage of Mugwort are seen practically everywhere in Boston. It seems to thrive in the rubbly soil of old building lots, and its seedlings carpet the ground of these lots in early summer. It has spread across entire blocks in areas of the city where many buildings have been demolished in recent years. Because of its conspicuousness in such areas, Mugwort, probably more than any other weed, signifies municipal neglect to most Bostonians.

This relative of the Sagebrush (*Artemisia tridentata*) is widespread in fields and waste places across the northern and western United States, particularly on limey soil. In appearance, Mugwort, a perennial, so closely resembles the more notorious Ragweed that it is often mistaken for that plant. However, Mugwort is easily distinguished by its strong scent and the silvery undersides of its leaves.

Sunflower Family (Compositae)

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Horseweed — *Conyza canadensis*

Native to the United States

HEIGHT: to 10 feet, but usually not more than 6 feet.

LEAVES: 1-6 inches long, narrow.

FLOWERS: small, inconspicuous, whitish heads; extremely numerous in a large, branched cluster at the top of the plant. July to October.

This coarse, annual weed is common and conspicuous in old fields, pastures, roadsides, and other open places throughout the United States. In the Southeast, it is the first plant to appear in fallow fields. It is found in a variety of habitats in Boston, but it is mostly abundant in newly cleared lots. Although it may grow to be nearly 10 feet tall, Horseweed often begins to bloom before it has reached a foot in height.

The foliage of Horseweed contains an oil that has been used as a mosquito repellent. This same oil renders the plant unpalatable to grazing animals, and it may produce an irritating reaction on human skin.



Sunflower Family (Compositae)

Lamb's Quarters, Pigweed — *Chenopodium album*



Naturalized from Europe

HEIGHT: up to 2-3 feet.

LEAVES: 1-2 inches long, with whitish undersides.

FLOWERS: inconspicuous, greenish, in irregular spikes. June to September.

An ancient and extremely nutritious food plant, Lamb's Quarters was one of the most valued leafy vegetables of early Europeans until Spinach was introduced from Asia in the sixteenth century.

Lamb's Quarters spreads copiously by seeds. It grows abundantly in Boston gardens and lots, and in fields, gardens, pastures and wasteland throughout the United States.

Its succulent young foliage may be cooked for greens, and its seeds can be ground into a flour which resembles buckwheat flour.

Goosefoot Family (Chenopodiaceae)

Curly (or Yellow) Dock — *Rumex crispus*



Naturalized from Europe

HEIGHT: up to 3 or 4 feet.

LEAVES: basal leaves 6-12 inches long, upper ones smaller.

FLOWERS: small, greenish, in dense spikes up to 12 inches long. June to September.

This is one of our most distinctive weeds, for its tall, stiff stalks are topped by large spikes of brown or rusty-colored seeds which stand out conspicuously against the greenness of surrounding vegetation.

Curly Dock grows in grasslands, old fields, and along roadsides throughout the United States. It appeared in New England shortly after the English arrived. Its perennial roots are deep and persistent, and its seeds are abundantly produced — up to 30,000 have been counted on a single large plant! Its seeds also may lie dormant in the soil for exceptionally long periods of time, allowing future generations of Curly Dock to spring up even after 50 years have passed by.

Birds are very fond of its seeds, and feed on them throughout the winter. Its thick, yellow roots have been used medicinally, and its first-year rosette of long crinkly leaves are sometimes gathered and cooked like Spinach.

Buckwheat Family (Polygonaceae)

Sheep (or Field) Sorrel — *Rumex acetosella*



Naturalized from Europe

HEIGHT: up to 12 inches.

LEAVES: light green, arrow-shaped,
 $\frac{1}{2}$ to 3 inches.

FLOWERS: very small, greenish or
reddish, in spikes. May to Sep-
tember.

This close relative of Curly Dock is distinguished from that plant by its small arrow-shaped leaves and daintier stature, but it too is conspicuous among most surrounding plants, due to its spikes of rusty-colored seeds.

Sheep Sorrel grows on dry, sandy or gravelly soil in old fields and meadows throughout the United States. It can grow on very acid soil where other plants have difficulty, and so it is often associated with such soils, but it also will grow in soils that are more neutral or even slightly alkaline.

This plant appeared in New England shortly after settlers arrived from Europe. Its creeping, perennial rootstocks make it a difficult plant to eradicate.

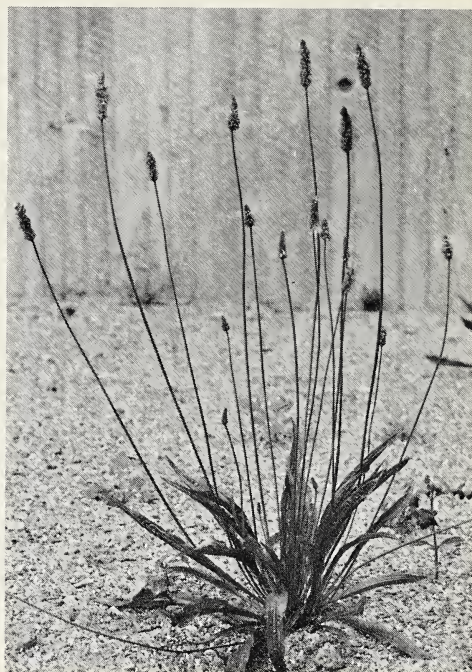
Sheep Sorrel's leaves have a refreshing, vinegary taste, and they are sometimes eaten raw in salads or cooked like spinach. The substance responsible for the sour taste, however, may be toxic in large quantities.

Buckwheat Family
(*Polygonaceae*)

Plantain — *Plantago* spp.



P. major



P. lanceolata

Some species native to the United States and others naturalized from Europe

The Plantains have a long history as travellers and have kept close company with man. Their association with our paths and roadsides is reflected in their Latin name, *Plantago*, which was derived from a word meaning "footprint."

Three different Plantains are often encountered in Boston. The Narrow-leaved Plantain (*Plantago lanceolata*) has come to us from Europe. It differs from the other species in its narrow leaves and its short flower clusters atop a long slender stalk. It is common in fields, roadsides, and other open areas. The Red-stem Plantain (*Plantago rugellii*), a native plant, and the very similar Broad-leaved Plantain (*Plantago major*), a European plant, both have broad leaves and long, slender flowering and fruiting spikes. They are common in lawns and sidewalk cracks.

The size of these plants varies enormously according to their environments. While all are pesty weeds in grassy places, the Red-stem Plantain has a particularly strong association with roadsides and the packed down soil of yards and paths. All are particularly difficult to eradicate, because they can easily regenerate from their perennial rootstocks if only the tops are chopped off.

Plantain Family (Plantaginaceae)

Pokeweed — *Phytolacca americana*



Native to the United States

HEIGHT: up to 8 feet, with reddish stems.

LEAVES: 4-12 inches long.

FLOWERS: small, greenish-white, become purplish with age; in long, slender, drooping clusters. July to August.

This is such a handsome plant that it has been imported to Europe to be grown as an ornamental. In Boston it is most commonly encountered in rather rich, damp ground. The juicy, deep red-purple berries are attractive to birds, which help to disperse the plants, and to children, who may be seriously poisoned by eating them.

All parts of the plants contain poisonous substances. The roots and the area where the roots and stems join are particularly dangerous. The berries reputedly become less toxic with age, and ripe ones have been used in baking, but cases of serious poisoning from eating them indicate that as few as three or four can seriously sicken a child.

The young shoots, however, are considered an excellent substitute for asparagus. If collected when less than 6 inches long, peeled, and boiled in at least two changes of water, they are perfectly safe. Older shoots on mature stems should never be eaten.

Pokeweed Family (Phytolaccaceae)

Shepherd's Purse — *Capsella bursa-pastoris*

Naturalized from Europe

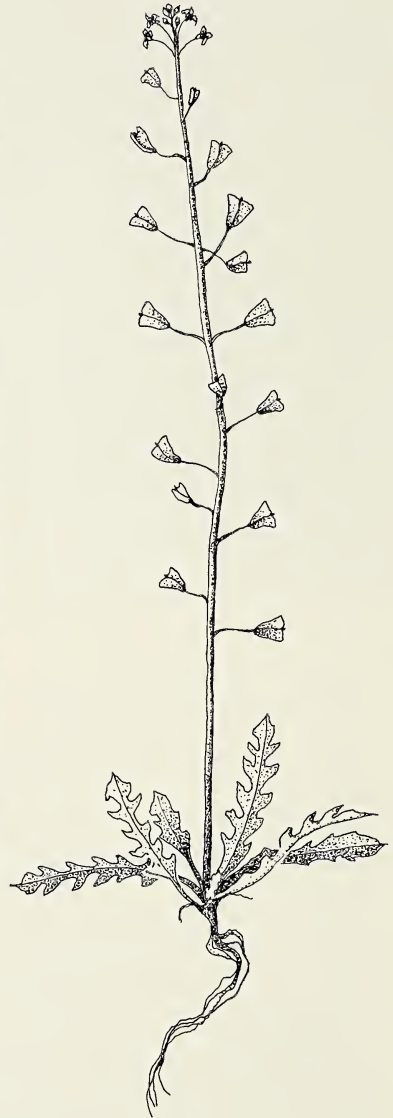
HEIGHT: 6-18 inches.

LEAVES: lower leaves irregularly toothed or lobed, clustered in a rosette; stem leaves small and clasping.

FLOWERS: tiny, white, inconspicuous $\frac{1}{16}$ - $\frac{1}{8}$ inch across. March to December.

The loose spike of tiny, flat, heart-shaped seed pods (resembling shepherd's purses) is the most conspicuous feature of this wiry little annual, which holds the distinction of being one of the most common weeds on earth. Shepherd's Purse grows in all cultivated regions of the world. It reproduces abundantly by seeds and is always assured of a good seed crop because its flowers are self-pollinated before they open. In addition, its seeds are remarkably long-lived and can lie buried in the soil for 35 years or more with occasional germination.

The seeds of Shepherd's Purse are eaten and dispersed by birds. The somewhat peppery young leaves of the plant are edible, and may be used in salads or cooked for greens.



Mustard Family (Cruciferae)

Peppergrass — *Lepidium virginicum*



Native to the United States

HEIGHT: 6-24 inches.

LEAVES: lower leaves 1-5 inches long, irregularly lobed; stem leaves smaller, narrower.

FLOWERS: inconspicuous, tiny, greenish-white in slender spikes up to 6 inches long. May to October.

Spikes of tiny, flat, circular seed pods resembling those of Shepherd's Purse are the most distinctive feature of this common little annual, which grows abundantly on most open sites in Boston.

The popular name "Peppergrass" alludes to the peppery taste of the plant's foliage and seeds, both of which are edible and are occasionally used as a minor food. Its young shoots may be substituted for watercress, and its seeds used as a seasoning for salads or soups.

Birds are quite fond of its seeds.



Mustard Family (Cruciferae)

Prostrate Knotweed — *Polygonum aviculare*

Naturalized from Europe

HEIGHT: prostrate stems, up to 2 feet long.

LEAVES: bluish-green, slender, $\frac{1}{4}$ -1 inch long.

FLOWERS: inconspicuous, greenish-white, tinged with pink $\frac{1}{12}$ inch across. June to October.

This species of Knotweed is often encountered on dry, hard-packed ground, and it forms a common ground cover in vacant lots, along the edges of sidewalks, and in garden borders.

An annual weed, its seeds are eaten and dispersed by small birds, and can pass through the digestive tracts undamaged.

Buckwheat Family
(*Polygonaceae*)



Grasses and Grasslike Plants



Grasses

Grasses are, and have long been, civilized man's most important food plants. The cereal grains — Corn, Wheat, Barley, Rice, Oats, etc. — which feed by far the majority of the world's people as well as their livestock, all are members of this large and widespread plant group.

Many Grasses are low plants with narrow leaves, like the species which commonly make up our lawns. Others, however, such as Corn and the various Bamboos, are much taller with relatively broad leaves. All of them produce small, greenish flowers, arranged in clusters of various types; some dense and spike-like, others loose and airy.

Many different Grasses, including several of the perennial lawn species, are common in a wide variety of habitats in Boston, but only a few of the more readily identifiable ones are included here. Perhaps Boston's most conspicuous Grass, at least by virtue of its size, is the plant known locally as Reed or Bulrush (*Phragmites communis*). Growing to 12 feet tall, this species forms impenetrable thickets along the Muddy River and the waterways in the Fens. This perennial, which spreads rapidly by means of thick, underground stems, is found in wet areas throughout the world. Although considered an unsightly menace by some Bostonians, it has been put to good use by the southwestern Indians as a shaft for arrows and as a weaving material.

Squirrel-tail Grass (*Hordeum jubatum*), a very attractive species, is a relative of the cultivated Barley. A native annual or biennial, it is widespread in North America. The long, tawny bristles that make this plant so conspicuous cause great discomfort to animals if eaten or inhaled. We have seen it only on the waterfront, but it is so conspicuous there that we felt it deserved to be included in this handbook.

Timothy (*Phleum pratense*), a perennial Grass with dense, spike-like flower clusters, is common in older lots in Boston. A native of Europe, it is extensively cultivated because it produces an excellent hay when cured. It has escaped from cultivation and is now a common wild plant in many parts of the United States.

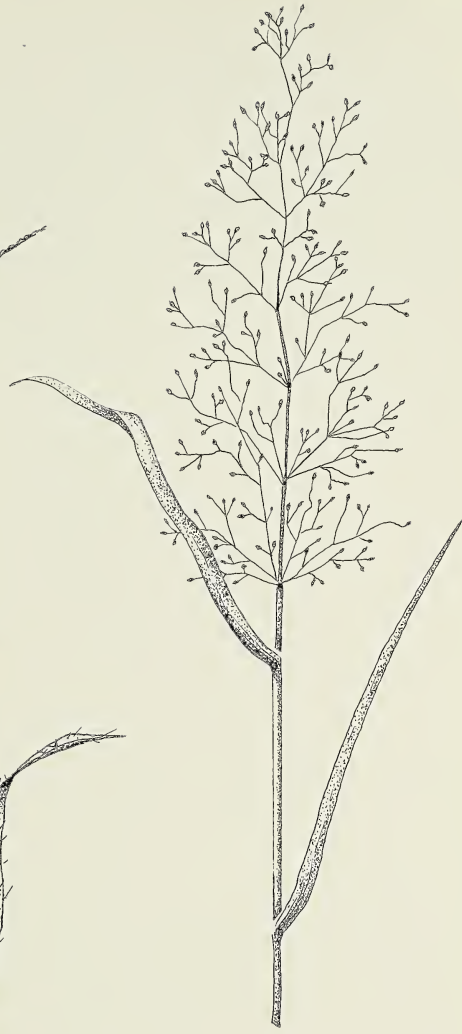
Crab-grasses (*Digitaria* spp.) are persistent weeds on both cultivated and fallow ground in many parts of the world. All are annuals, reproducing by seeds which remain viable for many years after ripening. Although suburban homeowners may despise them as pests in their lawns, some species of Crab-grass make good hay; also the seeds are very nutritious, and in Germany and Poland they are made into a kind of gruel.

Several species of Bent Grass (*Agrostis* spp.) are common weeds in Boston. The flower clusters are large (perhaps as much as a foot tall) and open, composed of many tiny florets on long, thread-like stalks. Large clumps of the Red-top (*Agrostis alba*), one of the most common species, appear as a red haze when fully mature. This species is an important lawn grass.

Grass Family (Gramineae)



Digitaria sp.



Agrostis sp.



Hordeum jubatum



Phleum pratense



Phragmites communis

Sedges

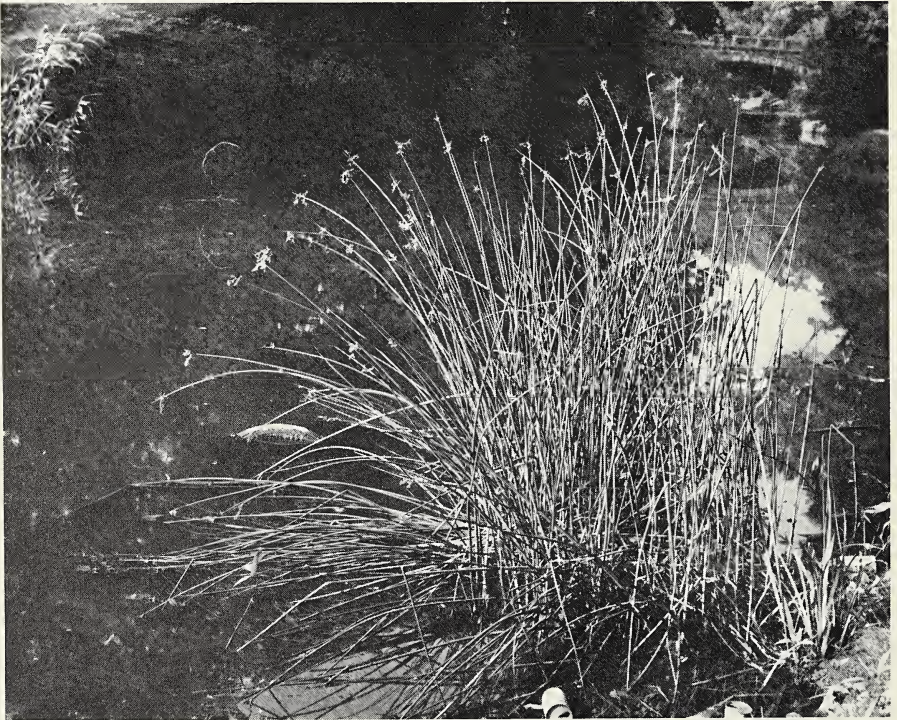
Native to the United States and most other parts of the world

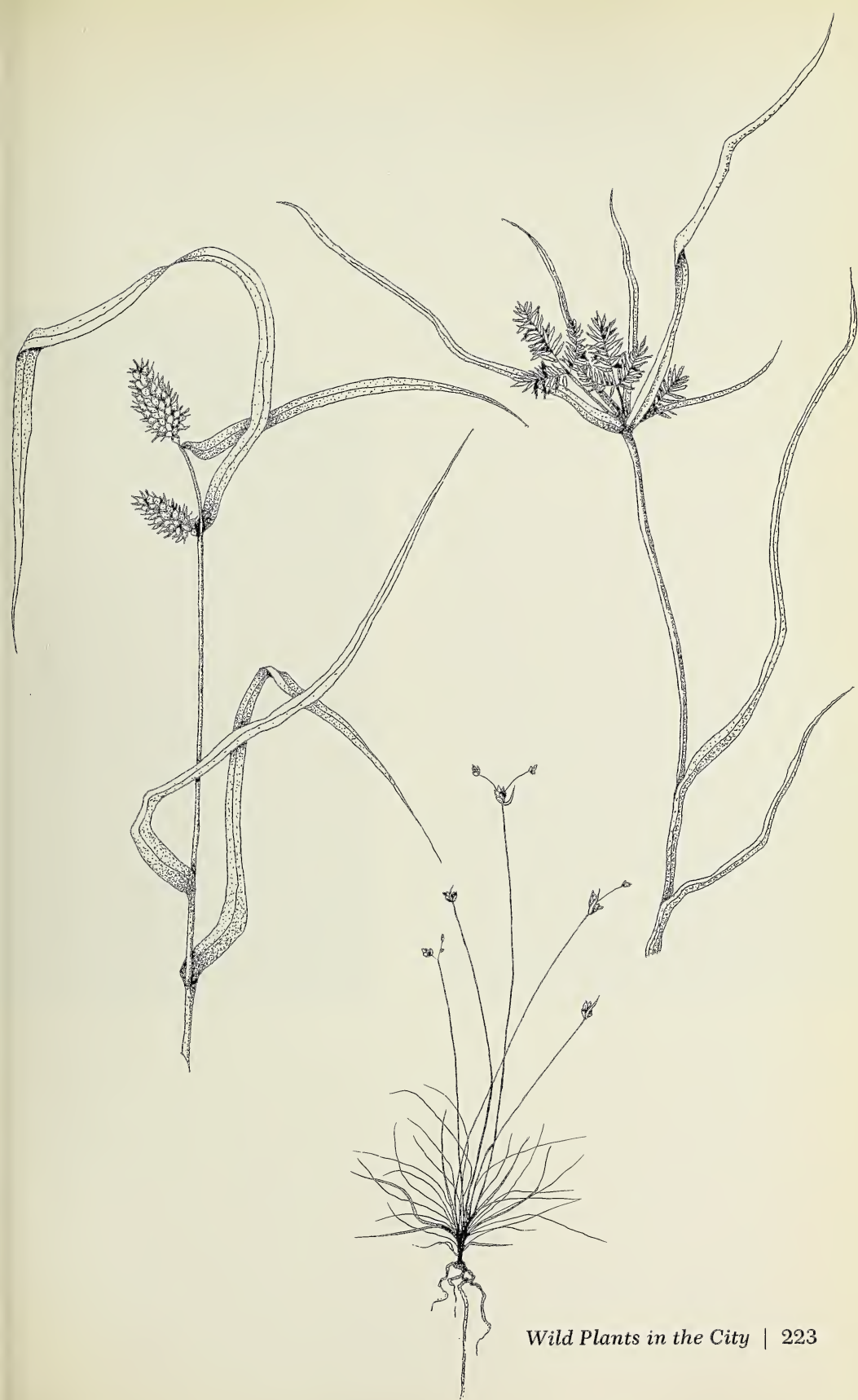
Sedges are a large group of grasslike plants characteristic of moist areas throughout the world, from the tropics to the polar regions. In Boston they grow along waterways or around the small pools which occasionally appear in vacant lots.

Since Sedges are difficult to identify, we have made no attempt here to differentiate between the various types. They resemble Grasses in many ways, and indeed the two groups are closely related. However, Sedges in general have solid stems which are triangular in cross-section, while Grasses have hollow, round stems. In Boston the different species of Sedge vary in height from 3 inches to 5 feet.

Sedges have few economic uses today. They were, and still are, used by the American Indians and native people of other countries for the weaving of baskets and other articles. Papyrus, a kind of Sedge, was used by the ancient Egyptians to make paper.

Sedge Family (Cyperaceae)





Cat-tail — *Typha latifolia*

Native to the United States

HEIGHT: up to 6 feet tall.

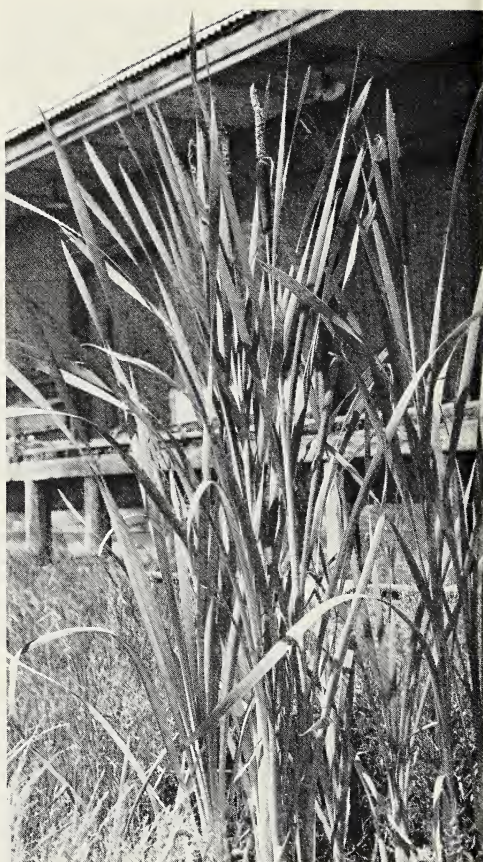
LEAVES: pale green, very long and slender, only $\frac{1}{4}$ - $\frac{3}{4}$ inch wide, but exceeding the stalk in length.

Cat-tails spring up quickly along the edges of small pools or puddles which occasionally collect in the low areas of old building lots in Boston. They are also to be seen in the Fens, along the Muddy River, and in ditches along local railroad tracks.

The attractive immature fruiting heads, shown in the accompanying illustration, often are used in dried floral arrangements. However, as the heads dry, they tend to come apart in cottony masses. This can be avoided to some extent by applying several coats of hair spray or one of the commercially available acrylic sprays.

Both the young and mature rootstocks may be eaten raw in salads or cooked as a vegetable. While still green, the young flowering spikes may be boiled for a few minutes and then eaten around the tough, central core, like corn on the cob.

Cat-tail Family (Typhaceae)



Trees and Shrubs





Tree of Heaven — *Ailanthus altissima*



Naturalized from Asia

HEIGHT: up to 60 feet or so.

LEAVES: pinnately compound, composed of numerous leaflets 3-7 inches long, with a reddish tinge when they first emerge in the spring.

FLOWERS: greenish-yellow, in clusters. The flowers on male trees have an extremely powerful and unpleasant odor. Showy clusters of red or gold, winged seeds in late summer.

No other tree can compete with the Tree of Heaven in its capacity to make itself at home in the strange environments produced by our cities. It can squeeze up through tiny cracks in a foundation wall or penetrate the mesh of a chain-link fence, and thrive in back alleys, gardens and the harsh, exposed sites of city lots. It seems to grow well regardless of soil moisture and fertility, and its irrepressible vigor and adaptability have allowed it to become a pest where most other trees must be coaxed and coddled to survive.

But if it were not for the spontaneous appearance of this great weed, many sections of cities such as New York and Boston would be far bleaker than they are today, for it is one of the most formidable forces working at bringing shade and greenery into every corner of our urban areas.

The Tree of Heaven was carried from Northern China to England in the mid-eighteenth century, and was brought to the United States by the end of the century. It was widely recommended for city planting at one time, but due to its invasive tendencies it is rarely planted now.

Quassia Family (Simaroubaceae)

Staghorn Sumac — *Rhus typhina*



Native to the central and eastern United States

HEIGHT: to 20 feet, but usually less.

LEAVES: pinnately compound of numerous toothed leaflets 2-4 inches long; smooth, dark green above, pale beneath, turning red in autumn.

FRUIT: erect clusters of hairy, red berries, very showy in late summer.

Staghorn Sumac forms dense, shrubby thickets on the dry, gravelly soil of sunny embankments and vacant lots in Boston. The plants become particularly conspicuous in late summer when the dense, erect clusters of berries, thickly covered with velvety bright red hairs, stand out almost like torches against the surrounding greenery. The thick twigs and branches of Staghorn Sumac also are densely covered with soft hairs, which give them the velvety brown appearance of a stag's immature antlers.

The berries of this Sumac are edible, and a refreshing beverage, which has been used as a gargle for sore throats, may be made by crushing the berries and straining the juice. Indians also used its leaves and fruits as a poultice to soothe irritated skin.

Cashew Family (Anacardiaceae)

Quaking Aspen — *Populus tremuloides*



From C. S. Sargent, Manual of the Trees of North America

Native to the United States

HEIGHT: up to 60 feet or so (has reached 100 feet).

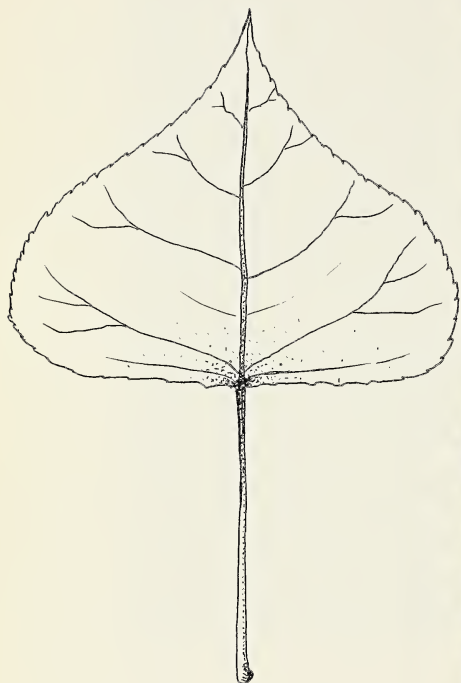
LEAVES: 1-3 inches long, slightly less wide, turning yellow in autumn.

This fast-growing, short-lived tree is very intolerant of competition and grows in open woods and clearings throughout the United States except in the Southeast. It is said to be the most widely distributed native tree in North America.

The Quaking Aspen is characterized by smooth, whitish or greenish-gray bark and leaves which tremble in the slightest breeze. The light, silky-haired seeds often are carried long distances by the wind, and they germinate one or two days after landing. This tree also reproduces by suckers which are abundantly produced along its long, shallow roots.

Willow Family (Salicaceae)

Lombardy Poplar — *Populus nigra* 'Italica'



Naturalized from Europe

HEIGHT: up to 90 feet, but usually much less.

LEAVES: somewhat triangular, 1-3 inches across.

The Lombardy Poplar, a narrow, columnar clone of the Black Poplar, was introduced into the United States in the late eighteenth century and since then has escaped from cultivation. It has been widely planted as a fast-growing screen throughout this country, but it is often troubled by borers and a canker which may cause death before it is 10 or 15 years old.

Relatively large specimens of Lombardy Poplar are seen growing wild on exposed sites in Boston, and young plants are found on many vacant lots.

Willow Family (Salicaceae)

Gray Birch — *Betula populifolia*



Native to the northeastern United States

HEIGHT: up to 30 feet, usually with multiple trunks in a clump.

LEAVES: triangular, 2-3 inches long, turning yellow in autumn.

BARK: white, with triangular black markings.

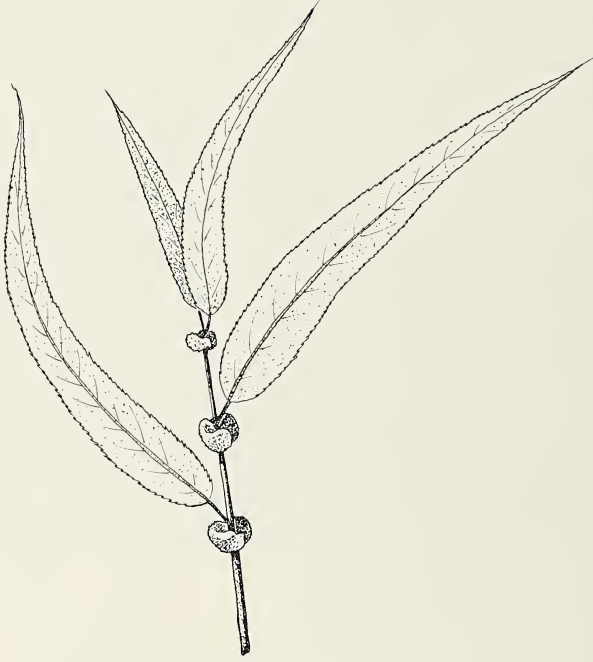
Seedlings and small saplings of this native Birch are often encountered on vacant lots, but larger trees are less often found growing wild in Boston — perhaps because they are not able to compete successfully with fast growing grasses and herbaceous weeds. Gray Birch seeds are very light, and, like those of the Aspen and Poplar, may be carried long distances by the wind.

This fast-growing, short-lived tree is abundant on dry, gravelly, barren soil throughout New England. It springs up in large numbers on abandoned farmland and in areas that have been recently burned. Like other pioneer trees, it provides protection for seedlings of trees that will eventually constitute a forest.

This photograph was taken above Brigham Circle, where the Gray Birch grows in association with Pin Oak (*Quercus palustris*) in steep puddingstone cliffs.

Birch Family (Betulaceae)

Willows — *Salix* spp.

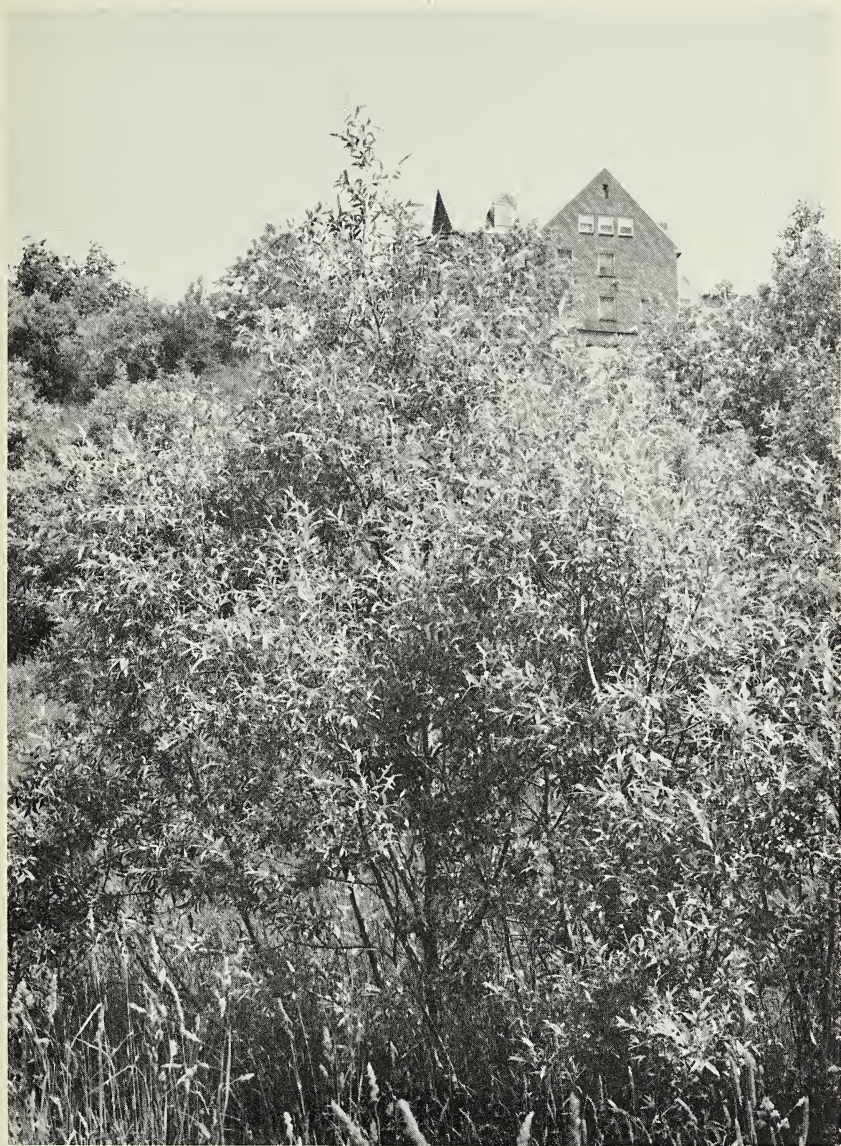


A variety of different Willows, grows wild in Boston. We have found at least five different ones, including both native and introduced species. As a group they tend to be associated with damp soil in low-lying areas, and they are generally rapid-growing, short-lived, and very intolerant of competition.

Willows produce large quantities of seeds which are carried long distances by the wind. This fact accounts for their presence on vacant lots far from seed producing trees.

While Willows have been cultivated widely, their inclusion in city plantings has been discouraged because their roots often clog drains and sewers.

Willow Family (Salicaceae)



Black Locust — *Robinia pseudoacacia*



Native to the Appalachians and some parts of the central United States

HEIGHT: to 70 or 80 feet, but usually less than 40 feet.

LEAVES: pinnately compound, of many oval, rounded leaflets 1-2 inches long.

FLOWERS: white, in Wisteria-like pendulous clusters in late spring, fragrant; followed by a cluster of narrow, Pealike pods.

Besides its decorative value in gardens and parks, the Black Locust has had a practical significance in forestry as an excellent, temporary cover for old fields and land strip-mined for coal. It grows rapidly (4 feet or more a year on good sites) and is able to tolerate a wide variety of soils. In addition, it can pave the way for less tolerant trees by improving the soil it grows on. Soluble nitrates, calcium, magnesium and potassium are released in its litter of leaves and twigs which rapidly decompose, and nitrogen-fixing bacteria associated with its roots further increase the nitrogen content of the soil.

Black Locust requires an open site to grow well, and will not tolerate competition from other plants. Its natural mode of reproduction is through the production of root suckers. Its seeds have very hard outer coats which are relatively impervious to water and do not germinate readily. However, some seedlings of the Black Locust do spring up here and there on open, sunny sites in Boston.



The Black Locust tree is distinguished by its deeply furrowed bark, thorny twigs, rich dark green leaves, and lovely, fragrant flowers. The wood is particularly resistant to weathering and thus was extensively used for fence posts. Despite its fine decorative characteristics, however, the Black Locust is no longer cultivated extensively in parks and gardens because of its susceptibility to injury from an insect known as the Locust Borer.

Legume Family (Leguminosae)

Honeylocust — *Gleditsia triacanthos*



Native to the Ohio and Mississippi Valleys

HEIGHT: to 70 or 80 feet.

LEAVES: lacy-textured; pinnately compound, of many leaflets $\frac{1}{2}$ -1 inch long.

FRUIT: long, narrow, flat, brown pods 1-1½ feet long.

In recent years, a thornless form of this tree that seldom bears fruit has become a popular tree for street plantings. The Honeylocust has an impressive list of characteristics that are considered important in urban conditions: it grows rapidly and is tolerant of alkaline soil, road salt, and drought; its lacy foliage casts light shade and does not obscure business signs; it creates minimal leaf litter to be raked up in the autumn.

In the wild this tree becomes established only in sunny openings, and, oddly enough, grows as a bottom land tree, preferring moist soil despite its reputation as a drought tolerant tree.

The seeds are scattered by animals, which feed on the sweet seed pods. The tough outer coverings of the seeds are softened (improving their chances of germination) as they pass through the digestive tracts of the animals.

While the native Honeylocust bear long, branched thorns sometimes reaching 4 inches in length, most of the trees planted in the city are thornless cultivars.

Legume Family (Leguminosae)



Ashes — *Fraxinus* spp.



F. americana

Native to the United States

HEIGHT: 40-60 feet, but occasionally in excess of 100 feet.

LEAVES: pinnately compound, of 5-7 oval, pointed leaflets 3-6 inches long.

FRUITS: 1-2 inches long, slender, winged at one end.

Two native Ashes grow wild in Boston. The White Ash (*Fraxinus americana*) is a large, fast-growing tree, which appears as a pioneer on fertile, abandoned fields in some parts of Massachusetts. It prefers a well-drained soil and is somewhat exacting in its soil nitrogen requirements. Its seeds are not apt to travel far (up to 400 or 500 feet) but abundant seedlings are produced in the vicinity of mature trees.

The Green Ash (*Fraxinus pennsylvanica*) prefers damper locations than the White Ash, and is most commonly found on alluvial soils along rivers and streams. In Boston it is often encountered along unmowed sections of the Muddy River. Its seeds are dispersed by water and wind. This is the most widely distributed Ash in North America.

Both of these Ashes have been widely planted in the United States. The White Ash is a very large tree growing to more than 100 feet tall. It is identified by its erect form and distinctive but unusual autumn foliage, a unique blend of yellow, russet, and purple. The Green Ash is smaller and more rounded in shape.

Olive Family (Oleaceae)

Oaks — *Quercus* spp.



Q. rubra



Q. palustris



Young Oaks spring up near parent trees or at fair distances if squirrels have transported and buried acorns; if given half a chance these trees thrive in Boston. One of the best examples of active Oak regeneration in the city can be seen along the Muddy River, where the original Oak plantings have been allowed to go wild and now cover a rather extensive area.

By far the most common Oak to be encountered in Boston is the Red Oak (*Quercus rubra*), a handsome tree which is native to the eastern United States and has been widely planted in Boston parks and along its avenues.

The Pin Oak (*Quercus palustris*) is another native Oak which is common in the city. Unlike the Red Oak, it can tolerate wet sites, but it is more sensitive to competition from other trees. It is distinguished by its more deeply cut leaves (which turn scarlet in autumn), a distinctive pyramidal outline, at least when young, and drooping lower branches.

Beech Family (Fagaceae)

Maples — *Acer* spp.



Above and right: *A. saccharinum*



Above and right: *A. rubrum*



Several different species of Maple spring up locally near parent trees here and there in Boston, but only two species are frequently encountered throughout the city: the Norway Maple (*Acer platanoides*) and the Sycamore Maple (*Acer pseudoplatanus*). Both trees are aliens, brought to the United States from Europe in Colonial days.

The Sycamore Maple is the more rugged of the two. It almost rivals the Tree of Heaven in its vigor and adaptability, and is very often found in gardens and on urban lots. It is characterized by coarse, dark green foliage (resembling the Sycamore leaf in shape, hence its name), distinctive long clusters of winged seeds, and flaky bark.

The Norway Maple has been more widely cultivated than the Sycamore Maple in recent years. In fact, it has been one of the most widely planted street trees in the eastern United States during the past century. Its popularity has stemmed from its beautiful show of greenish-yellow flowers in early spring before its leaves are out, its yellow autumn foliage, and its fairly strong tolerance of difficult growing conditions. As its winged seeds ripen, they are showered over the ground below, and are found germinating in nearby gardens, gutters, or any shallow little pocket of moist soil the following spring. But the saplings of this tree are fussier about their growing conditions than those of the Sycamore Maple, and make their best growth in the moist fertile soil of open gardens.

Two other Maples are occasionally encountered locally in Boston. The Red Maple (*Acer rubrum*), a common tree in low woods throughout the eastern United States, is distinguished because of its brilliant red autumn foliage. The Silver Maple (*Acer saccharinum*) was widely planted along New England streets in the past, but its use has been discouraged because it attains a very large size and the wood is brittle. Seedlings of both these species are locally common in scattered locations, but mature trees growing wild are rare.

Maple Family (*Aceraceae*)



Black or Rum Cherry — *Prunus serotina*



Native to the United States

HEIGHT: 15-40 feet, but occasionally to 90 feet.

LEAVES: lustrous, oval with pointed tips, 1½-6 inches long, with finely toothed margins.

FLOWERS: small, white, in slender, showy, drooping clusters 4-5 inches long; followed by small, black fruits ¼ inch or so in diameter.

This is a pioneering tree of secondary successions that cannot tolerate the competition for sunlight, moisture and nutrients in dense forests. It seems to grow best in slightly protected sites with moist, fertile soil, such as that provided by small clearings and the peripheries of thickets and woodland in the countryside. In the city it is most commonly found on the edges of gardens and parks, or in slightly overgrown areas.

The Black Cherry becomes particularly conspicuous in the late spring, when its long, narrow clusters of small white flowers come into bloom. These flowers are followed in late summer by clusters of small, black cherries which are edible and widely dispersed by feeding birds. Its fruits have been used to make jelly and wine, and also to flavor rum or brandy (hence its popular name, "Rum Cherry"). The wood has been prized for cabinetmaking since Colonial days, and as a consequence there are few large trees still to be found growing in the wild.

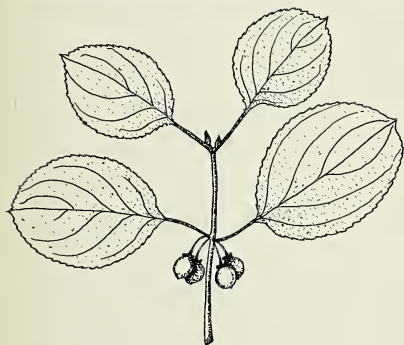
The Choke Cherry (*Prunus virginiana*), a similar species, also is found wild in Boston. Its fruits are acid and puckery, without the winey taste characteristic of those of the Black Cherry.

Rose Family (Rosaceae)

Buckthorns — *Rhamnus* spp.



Above: *R. cathartica*



R. frangula

Naturalized from Europe

HEIGHT: to 20 feet.

LEAVES: roundish to oval, with toothed margins in the Alder Buckthorn, 1-3 inches long.

FRUITS: black, Cherry-like, borne singly or in clusters of 2-5.

The two Buckthorns that grow wild in Boston are the Common Buckthorn (*Rhamnus cathartica*) and the Alder Buckthorn (*Rhamnus frangula*), both introduced species. Several native species occur in the Northeast, but none has been seen in Boston.

The Buckthorns are large, coarse, rapid-growing shrubs with lustrous dark green leaves. They often appear in association with Black Cherry along the slightly overgrown edges of parks and gardens. They were originally introduced from Europe for use as hedges, and have escaped from cultivation to hedgerows, thickets and open woods throughout the eastern United States. Their seeds are widely scattered by birds, which are attracted to the shrubs by the berries. Since the fruits of the Alder Buckthorn ripen at slightly different times, there may be green, red and black ones all growing on the same plant at one time. The fruits of both species are violently purgative and should not be eaten.

Buckthorn Family (Rhamnaceae)

Elms — *Ulmus* spp.



U. pumila

Elms are distinguished by their coarsely toothed leaves that are often lopsided at the base and rough on the upper surface. The Siberian Elm (*Ulmus pumila*) is the one most commonly found growing wild in Boston. This native of Siberia and northern China is a tough, rapid-growing tree eventually becoming as tall as 75 feet, that does well on dry, exposed sites with infertile soil. It has been widely planted in recent years, particularly in the Midwest, and has proved to be a valuable screen tree in drought-prone areas of the Great Plains.

The Siberian Elm, however, is rather undistinguished in appearance, and has neither attractive flowers, colorful autumn foliage, nor graceful shape to recommend it for general planting. In addition, the wood is brittle, and its abundant seedlings can be annoying. It might be distinguished from most other Elms by its small, 1 to 3-inch long leaves.

The American Elm (*Ulmus americana*), a native American tree, also is occasionally found as a volunteer in Boston. This very fine tree, with its graceful, fountain-shaped habit, is one of New England's most distinctive and widely planted shade trees. Unfortunately, it is highly susceptible to the Dutch Elm disease which is caused by a fungus.

Elm Family (Ulmaceae)



U. americana

Raspberries and Blackberries — *Rubus* spp.



Native to the United States

HEIGHT: to 5-6 feet, but usually much lower and spreading, often vine-like.

FLOWERS: to an inch or more across with 5 white petals, followed by sweet, juicy, dark reddish or purplish fruits.

Raspberries and Blackberries are widely distributed throughout the Northern Hemisphere. Many species are weeds of fields, roadsides, fencerows, and other open areas; others persist after cultivation around old homesites. All of them are prickly or thorny, and the more vinelike Blackberries, often called Brambles, are particularly unpleasant to walk through.

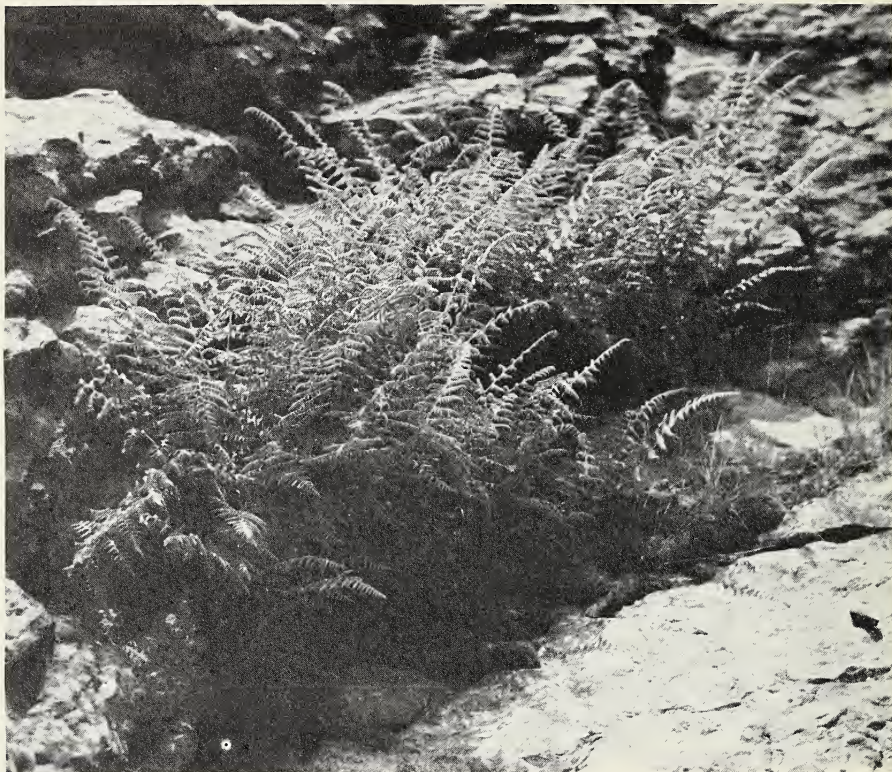
The "berries" of these plants are familiar and delicious. They are actually tight clusters of tiny fruits, each with a single seed. When Raspberries are picked, the central portion, a whitish, cone-shaped structure, remains on the plant. In Blackberries, this central portion does not separate from the fruit, causing the fruit to be somewhat tough in the center.

Rose Family (Rosaceae)

Ferns



Hay-scented Fern — *Dennstaedtia punctilobula*



Native to eastern United States

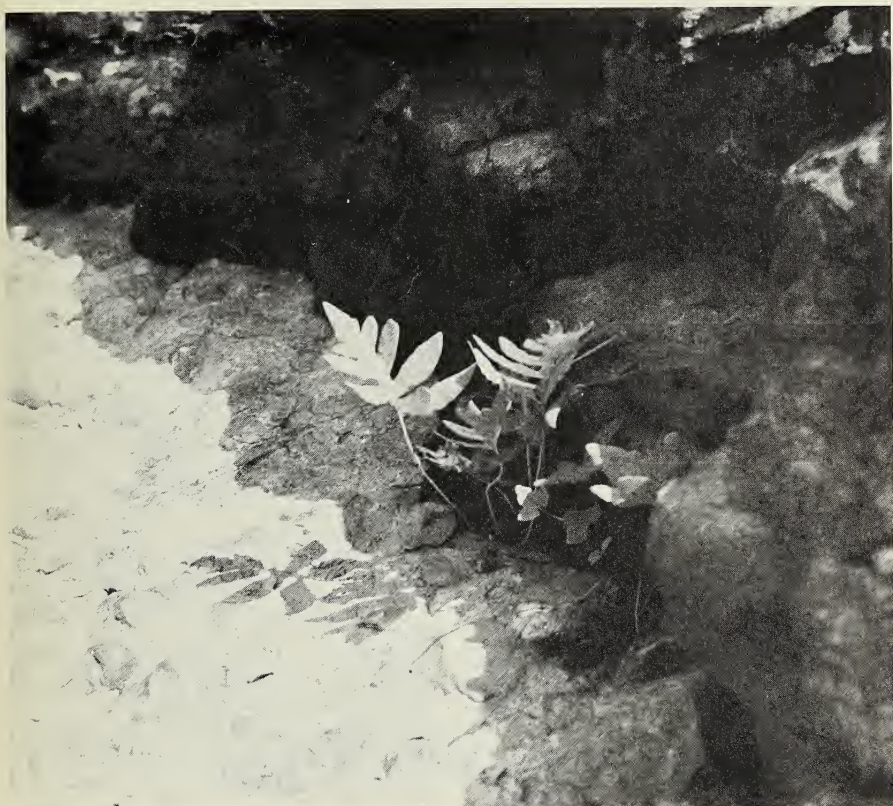
This is a common Fern in a variety of habitats, from shady woods to open, rocky pastures, in the eastern half of our country. It is rare in Boston, however.

Unlike the other plants treated in this handbook, Ferns do not produce flowers or seeds. They reproduce by spores which are borne in brownish spots of various shapes on the undersides of the leaves. In the Hay-scented Fern, the spore-spots are enclosed in minute cups located near the tips of the smallest lobes on the leaves.

The Hay-scented Fern is a somewhat invasive species, spreading by fast-growing underground stems. Its leaves, which are finely divided and up to 2 feet long, do not appear in clumps as do those of many other Ferns. Rather, they sprout individually along the underground stem. Their sweet scent, resembling that of fresh-mown hay or grass, is evident when they are crushed, and particularly so when dried.

Fern Family (Polypodiaceae)

Sensitive Fern — *Onoclea sensibilis*



Native to eastern United States

Ferns are uncommon in Boston, but this is the one most frequently encountered. It is a familiar plant in wet areas and low woods throughout New England. In Boston it is most abundant along the Muddy River, but the photograph above was taken on a series of cliffs on Mission Hill, quite an atypical habitat.

The leaves of the Sensitive Fern may grow to nearly a foot long. They are pale green in color and not as finely divided as in most Ferns. The spores are borne on separate leaves which are greatly modified in shape, without any obvious resemblance to the normal (sterile) ones. The whole structure resembles an upright cluster of small grapes.

This Fern is particularly sensitive to even the lightest frost, hence its common name.

Fern Family (Polypodiaceae)

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ARNOLDIA

The Arnold Arboretum

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Contents

LOW MAINTENANCE PERENNIALS

Part I

Text: ROBERT S. HEBB

Drawings: ROBERT OPDYKE

(All photographs by author,
unless otherwise indicated.)

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Cover: The bold shape and texture of a Hosta sieboldiana leaf provides a sharp contrast to the more delicate foliage of an Astilbe × arendsii cultivar.

Some Necessary Definitions

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Terms May Be Misleading

By definition, a perennial is a plant which lives on from year to year, not completing its life cycle in a single season as annuals do; or in two years, as with biennials. Properly applied, the term "perennial" includes trees, shrubs, and herbs. Trees and shrubs are woody; herbs die to the ground each winter.

The term "herb" is loosely used by many gardeners in referring to a special group of plants grown for culinary or medicinal purposes. While some of these plants are perennials, others are annuals or biennials; some are woody perennials and could not be classed as "herbs" according to the botanical definition of the word.

Perennial herbs are classified in many other ways, and terms become even more confusing when we consider the special uses of plants in the garden. Some perennial herbs are grown in a place called the "wild flower garden." These may be plants that are native locally, or come from much wider geographic areas and have cultural requirements similar to the plants of the local region. Other perennial herbs either require, or will tolerate, a great deal of moisture and, when grown together in a wet place, may constitute a bog garden. Others may be low in stature or will endure hot, dry conditions. When, in various ways, they are combined with rocks or boulders and certain shrubs, they form a rock garden.

Plants in all the categories above have representatives that, when planted closely under just the right conditions, grow together densely and tend to discourage competition from other plants. Under these circumstances they qualify as ground covers.

Obviously, perennial herbs cannot be considered always in separate categories. One group we have not discussed yet is the subject of this Handbook: the plants traditionally known as "herbaceous perennials", or just "perennials", and customarily grown in a place called the "perennial garden" or the "herbaceous border." This group draws representatives from all the

above groups of perennial herbs, and its members are most often cultivated for their bright flowers; but plants with interesting foliage effects also are included.

The very word "perennial" conjurs up the idea of permanence, and to those who would make a perennial garden the great trap is that permanence is equated all too often with ease of culture or freedom from a great deal of maintenance. In his *Standard Cyclopædia of Horticulture*, Liberty Hyde Bailey succinctly sums up the problem as follows:

A popular fallacy about perennials lies in the common statement that "they die down every year and come up again in the spring." Many of them never come up again after two or three years of flowering; that is *perennials are not necessarily perpetual*. (our emphasis) Peonies may be as long-lived as shrubbery, and a clump of *fraxinella* * has been known to outlive father, son, and grandson in the same spot. But these are exceptions. The general practice with perennials is to divide them every second or third year. Nearly all hardy herbaceous plants should be lifted now and then, because the crowns that give the flowers in most desirable kinds flower only two or three seasons and then die; but the plant may be continually spreading and making new growths, which furnish the flowers, and, unless lifted and divided, the stocks become scattering and unattractive.

Standards for Low Maintenance Perennials

Another feature of these plants that the word "perennial" does not convey is that many have exacting requirements which must be catered to if any degree of perfection whatever is to be attained. The cultivation of several of such types together in the same garden will add up to a lot of work; certainly more work than the novice gardener, or even the experienced one with little spare time, would wish to devote.

Some of the "faults" many perennials have which will necessitate considerable maintenance can be itemized as follows:

- Short-lived.
- Require annual or biennial division of the crowns.
- Become invasive.
- Subject to attack by insects or diseases.

* *Dictamnus albus*, the Gas Plant

- Need staking and tying to prevent flopping.
- Foliage does not remain attractive during the entire growing season.
- Tolerate only a very narrow range of growing conditions with regard to soil, moisture, or light.
- Not fully hardy.

Possession of any of the above "faults", with the exception of the last, is probably not sufficient reason in every case to ban particular plants from the garden, even when the standard for minimal maintenance is a priority. If this were so, the list of perennials that could be grown would be a scanty one indeed! It is when certain plants combine two or more of these "faults" that they may be regarded as requiring considerable maintenance.

To look on the brighter side, there are many perennials that possess the endearing qualities of ease of culture, a relatively long life, and freedom from insects and diseases. However, the gardener who lacks years of experience faces the very considerable problem of selecting these from amongst the many hundreds of varieties available from nurseries. Catalogs are notorious for their glowing descriptions of flower color, or any other good attribute a plant may possess; however, information about the amount of work necessary to produce a dazzling display or the life expectancy of a plant is mighty scanty. This is not meant to discredit the nurserymen. In general, American nurseries are doing a fine job of offering the better species or selections to a very heterogeneous group of gardeners.

Textbooks too, are not always the most convenient sources of information about low maintenance perennials. They often tend to be encyclopedic in nature — some even include varieties that are completely unavailable from nurseries. For the average reader it thus becomes tedious to select those plants that are easiest to grow from the numerous varieties described, and the lengthy cultural formulae provided.

In this discussion we wish to draw attention to the perennials that will require the least amount of maintenance. We know of no desirable plant, however, that can be expected to thrive in the garden without some form of attention. This handbook,

therefore, should not be considered a "lazy man's guide" to perennials. The standards we have selected that qualify a plant as "easy" in the ensuing text are as follows:

- Will not require division for about four years under normal circumstances; some can go much longer.
- Perfectly hardy in the Boston area, though some form of winter protection is advisable for most perennials. (In this category we also place resistance to summer heat as a type of hardiness.)
- Immune to, or tolerant enough of, insect and disease problems so that spraying usually will not be necessary.
- Stems sufficiently sturdy so that staking may be avoided under most circumstances.
- Tolerant of a fairly wide variety of soil types and conditions.
- Foliage remains in acceptable condition through the growing season. If not, it dies down quickly and may be masked by surrounding plants.

In applying these standards, we banish some of the showiest of all perennials. Gone are the hybrid Delphiniums, most of the hardy Chrysanthemums, and Phloxes, Lupines, or Carnations, and many others traditional to the perennial garden. But how many traditional perennial gardens do we see nowadays? In our hurried times, perennials have come into some measure of disfavor because a few of the more famous ones are the most difficult to grow. People have tried them, have had good results only temporarily, and have given up altogether.

Recommended Perennials for Low Maintenance

The perennials we recommend for ease of culture are described in this chapter. Representatives of most all the major groups discussed here have been tried at one time or another at the Case Estates of the Arnold Arboretum in the area known as the Low Maintenance Garden. This garden is situated in a frost pocket where winter temperatures may drop to -20° F, or lower. Soil conditions in some parts of the garden are very moist, especially during the winter months, and some perennials are either killed or heaved out of the ground during alternate periods of freezing and thawing. Some sections of the garden receive full sun all day, while others remain either in partial or deep shade.

Thus we have been able to observe and record the performance of many perennials under adverse, and frequently poor, growing conditions. We make the basic assumption that a plant which has performed well for several years in the Low Maintenance Garden can be grown in most gardens in the Boston area, and often considerably further north.

In order that gardeners may make intelligent choices when selecting their plant materials, we discuss in alphabetical order most all the major genera of perennials offered by the nursery trade. Those that qualify as "easy" plants, and are especially recommended as low maintenance subjects, occupy the main body of the text. Those which are of secondary value (or of no value at all where low maintenance is concerned) are included, but set apart in smaller type. This secondary listing is in no way meant to condemn the groups of plants involved. As already stated, some of the most beautiful perennials belong in these groups. If a gardener has selected mainly the recommended plants, he then may have the time to cater to the needs of a few of the more demanding types if he so desires.

We have attempted to provide as many sources as possible for each plant discussed. Most of the nurseries included publish a retail catalog on a national basis and will ship plants. A few nurseries are represented which do not ship, but their lists are

so extensive that they warrant inclusion. Several desirable cultivars seem to be available only from wholesale nurseries, which will not deal directly with the general public. If this is the case with a plant you wish to obtain, we recommend that you persuade a local nurseryman to get it for you from the wholesaler; do not attempt to deal with wholesale nurseries directly. Wholesale sources are included here mainly for the benefit of the professional horticulturist or landscape architect entitled to use them or, hopefully, the operators of local retail outlets who may wish to extend their offerings to include some of the more desirable varieties discussed.

Retail nurseries are identified by a series of numbers after the description of each plant; wholesale nurseries, by a series of letters. These correspond to a list of the nurseries beginning on page 7. Before deciding to order a particular plant from any of these sources, it would be prudent first to see if it is available from a local garden center or nursery. It is always better to obtain a plant locally when possible; the plant's size and condition are then known to the buyer. Also, local nurseries frequently sell perennials already established in containers; therefore the possible shock of transplanting or delays in the mail can be avoided.

According to the listings which follow, it may appear that some worthy perennials have limited availability; that is, they are available only from one or two mail order nurseries. These listings do not present the true picture in every case, however. In all major population centers there are garden outlets or nurseries which operate on a local basis and do not distribute lists or catalogs. Thus some plants enjoy a popularity which our listings do not reflect.

Exclusion of a nursery is not intentional on our part. The listings were compiled from the hundred or more catalogs of American dealers in perennials currently represented in the Arnold Arboretum's catalog collection. It is quite possible that other sources exist of which we are not aware. We did not deem it expedient to list general nurseries which offer only four or five of the recommended varieties. Further, many specialists in rock garden plants and wild flowers list a few plants suitable for the perennial border; some of these dealers could not be included. There are far more nurseries specializing in *Iris*, *Hemerocallis*, or *Paeonia* than we could list. For more information about these, consult the advertisement sections of *The Hemerocallis Journal*, (the publication of the American Hemerocallis

Society), the *Bulletin of the American Iris Society*, and *The American Peony Society Bulletin*.

Inclusion here of a particular nursery does not constitute an endorsement by the Arnold Arboretum, nor does it guarantee that plants obtained will be true to name, nor that sources will not change from year to year.

RETAIL NURSERY SOURCES FOR HERBACEOUS PERENNIALS

1. J. Herbert Alexander, Dahliatown Nurseries, Middleboro, Mass. 02346.
Specializes in Lilacs, Blueberries, shrubs, ground covers and perennials. Ships.
2. Armstrong Nurseries, Inc., Box 473, Ontario, Calif. 91761.
Principally a grower of Roses, but catalog lists an interesting selection of Hardy Hibiscus. Ships.
3. Arrowhead Gardens, Inc., 115 Boston Post Rd., Wayland, Mass. 01778.
Extensive list of perennials, rock garden plants and others. Does not ship.
4. Avalon Mountain Gardens, Dana, N.C. 28724.
Extensive listings of perennials, wild flowers, and some woody plants. Ships.
5. Beersheba's Wild Flower Gardens, P.O. Box 551, Beersheba Springs, Pa. 37305.
Mostly wild flowers, but list includes a few perennials suited to the border. Ships.
6. Myron D. Bigger, 201 North Rice Rd., Topeka, Kan. 66616.
Specializes in Peonies, many of which are Mr. Bigger's own named varieties. Also Hemerocallis. Ships.
7. Blackthorne Gardens, 48 Quincy St., Holbrook, Mass. 02343.
Specializes mostly in bulbs, but also lists some perennials, particularly *Hosta*. Ships.
8. Brand Peony Farm, Box 36, Fourbault, Minn. 55021.
Specializes in Peonies, Iris, and Lilacs. Ships.
9. Bristol Nurseries, Inc., Bristol, Conn. 06101.
Specializes in hardy Chrysanthemums. Extensive list. Ships.
10. Brown's Sunnyhill Gardens, Route 3, Box 102, Milton-Freewater, Ore. 97862.
Specializes in Bearded Iris. Extensive list. Ships.
11. Burge's Iris Garden, 1414 Amhurst, Denton, Tex. 76201.
Specializes in Iris. Extensive list. Ships.
12. W. Atlee Burpee Co., Box 6929, Philadelphia, Pa. 19132.
The fall catalog, separate from the main seed catalog, lists bulbs and plants, including some perennials. Ships.
13. Carroll Gardens, Westminster, Md. 21157.
Extensive retail list of perennials of all kinds. Also herbs, ground covers, trees and shrubs. Separate wholesale list for perennials. Ships.

14. Conley's Garden Center, Inc., Boothbay Harbor, Me. 04538.
General line of nursery stock, including perennials. These are mostly available at the garden center, only a few being included in the list of materials which can be shipped. The catalog has been very thoughtfully produced, and is a horticultural handbook in itself.
15. The Conard-Pyle Co., Star Roses, West Grove, Pa. 19390.
Specialists in Roses. Catalog also offers a selection of perennials. Ships.
16. Cooley's Gardens, Silverton, Ore. 97381.
Specializes in Bearded Iris. Extensive, profusely illustrated color catalog — \$.50. Ships.
17. P. DeJager & Sons, Inc., South Hamilton, Mass. 01982.
Catalog primarily lists bulbous plants, but sometimes includes a few perennials. Ships.
18. Dooley Gardens, R.R. 1, Hutchinson, Minn. 55350.
Specializes in Chrysanthemums. Ships.
19. Eden Road Iris Garden, P.O. Box 117, Wenatchee, Wash. 98801.
Specializes in Bearded Iris. Extensive profusely illustrated color catalog — \$.50. Ships.
20. Emlong's Nurseries, Inc., Stevensville, Mich. 49127.
Catalog of general nursery items including a few perennials. Ships.
21. Englerth Gardens, Route 2, Hopkins, Mich. 49328.
Specializes in *Hosta*, *Hemerocallis*, Siberian and Japanese Iris. Ships.
22. Far North Gardens, 14621 Auburndale Ave., Livonia, Mich. 48154.
Specializes in hardy Primroses, both plants and seed. Very extensive list. Ships.
23. Fowler's Nursery, 4210 Fayetteville Rd., P.O. Box 10324, Raleigh, N.C. 27605.
Perennials, bulbs, bedding plants, trees and shrubs. Ships in the southern states only.
24. Garden Place, 6780 Heisley Rd., Mentor, O. 44060.
Extensive list of perennials of all kinds. This is the retail outlet for Springbrook Gardens, Inc. Ships.
25. Gurney Seed & Nursery Co., Yankton, S.D. 57078.
Catalog of general nursery items, includes some perennials. Ships.
26. Ruth Hardy's Wildflower Nursery, Falls Village, Conn. 06031.
Specializes in wild flowers and ferns. Some suited to the perennial border. Ships.
27. Hi-Mountain Farm, Seligman, Mo. 65745.
Extensive list of wild flowers and ferns. Many suited to the perennial border. Ships.
28. Inter-State Nurseries, Hamburg, Ia. 51644.
Catalog of general nursery items. Lists some perennials. Ships.
29. The Jamieson Valley Gardens, Jamieson Rd., R. 3, Spokane, Wash. 99203.
Hardy perennials, alpine, wild flowers and Western native plants. Catalog \$1.00, free with orders over \$10.00. Ships.

30. Kelly Brothers Nurseries, Inc., Dansville, N.Y. 14437.
Catalog of general nursery items. Includes some perennials.
Ships.
31. Charles Klehm & Son, 2 East Algonquin Rd., Arlington Heights,
Ill. 60005.
Specializes in Peonies, especially the Estate Peonies developed
at Klehm's. Extensive list. Ships.
32. Lamb Nurseries, E 101 Sharp Ave., Spokane, Wash. 99202.
Extensive list of perennials of all kinds. Also rock garden
plants, and some shrubs which combine well with perennials.
Ships.
33. H. V. Lawrence, Inc., The Cape Cod Nurseries and Gardening
Center, P.O. Drawer B, Falmouth, Mass. 02541.
General nursery stock including perennials. Does not ship,
but a good source for perennials on Cape Cod. (Apparently
a catalog is no longer being published.)
34. The Lehman Gardens, Faribault, Minn. 55021.
Extensive listing of hardy garden Chrysanthemums. Ships.
35. Lexington Gardens, 7007 Manchester Ave., Kansas City, Mo.
64133.
Specializes in *Hemerocallis*. Extensive list. Ships.
36. Mathews Iris Gardens, 201 Sunny Dr., College Place, Wash.
99324.
Specializes in Bearded Iris. Extensive list. Ships.
37. Earl May Seed & Nursery Co., Shenandoah, Ia. 51603.
Catalog of general nursery items and seeds. Lists some pe-
rennials. Ships.
38. Melrose Gardens, 309 Best Rd., South, Stockton, Calif. 95206.
Specializes in Iris of all types. Extensive lists. Catalog \$.35.
Ships.
39. Mincemoyer Nursery, County Line Rd. (Route 526), Jackson,
N.J. 08527.
Perennials, wild flowers, herbs. Ships.
40. Mission Gardens, Highway 43 (Waukegan Rd.), Techny, Ill.
60082.
Specializes in Peonies (both herbaceous and tree types), and
Hemerocallis. Extensive lists. Ships.
41. Mission Bell Gardens, 2778 West 5600 South, Roy, Ut. 84067.
Specializes in Bearded Iris. Extensive list. Ships.
42. Moldovan's Gardens, 38830 Detroit Rd., Avon, O. 44011.
Specializes in *Iris*, *Hemerocallis*, and Peonies. Ships.
43. Orchid Gardens, Route 3, Box 224, Grand Rapids, Mich. 55744.
Specializes in native plants, but lists some suited to the
perennial border. Catalog \$.25. Ships.
44. George W. Park Seed Co., Inc., Greenwood, S.C. 29647.
A catalog, separate from the main seed catalog, lists supplies,
bulbs and plants, including some perennials. Ships.
45. Pellett Gardens, Atlantic, Ia. 50022.
Specializes in plants which attract bees, but catalog also
contains some plants useful in the perennial border. Ships.
46. Putney Nursery, Inc., Putney, Vt. 05346.
Good list of perennials. Also wild flowers, ferns, herbs, trees,
shrubs, and vines. Ships.

47. David L. Reath, Box 251, Vulcan, Mich. 49892.
Specialist in Peonies, both the herbaceous and tree types.
Ships.
48. Richland Iris Productions Ltd., Richland Center, Wis. 53581.
Extensive list of Iris, including Siberian and Japanese types.
Ships.
49. The Rock Garden, Litchfield-Hallowell Rd., RFD 2, Litchfield,
Me. 04350.
Extensive list of plants for the perennial border and the rock
garden. Catalog states that listing may vary considerably
every year. Ships.
50. Savage Gardens, P.O. Box 163, McMinnville, Tenn. 37110.
Supplier of wild flowers and ferns, some appropriate to the
perennial garden. Ships.
51. Savory's Greenhouses, 5300 Whiting Avenue, Edina, Minn.
55435.
Specializes in *Hosta*. Extensive list. Ships.
52. Schreiner's Gardens, 3625 Quinaby Rd., N.E., Salem, Ore. 97303.
Specializes in Bearded Iris. Also Siberian and Spuria types.
Extensive list. Catalog profusely illustrated in color. \$.50.
Ships.
53. R. H. Shumway, Rockford, Ill. 61101.
General catalog of seeds and plants. Some perennials. Ships.
54. C. G. Simon Nursery, Inc., P.O. Box 2873, Lafayette, La. 70501.
Specializes in *Hemerocallis*. Extensive list. Ships.
55. Smith's Iris Gardens, 614 Bryden Ave., Box 483, Lewiston, Ida.
83501.
Specializes in Bearded Iris. Extensive list. Ships.
56. Southern Meadows Garden, 1424 South Perrine, Walnut Hill
Rd., P.O. Box 230, Centralia, Ill. 62801.
Extensive list of Bearded Iris and *Hemerocallis*. Ships.
57. Sperka's Woodland Acres Nursery R2, Crivitz, Wis. 54114.
Perennials and wildflowers. Ships.
58. Spring Hill Nurseries, Tipp City, O. 45366.
Catalog of general nursery items. Lists some perennials.
Ships.
59. Stanek's Garden Center, East 2929 27th Ave., Spokane, Wash.
99203.
General line of nursery stock, includes a list of perennials.
Ships.
60. Stern's Nurseries, Inc., Geneva, N.Y. 14456.
General line of nursery stock. List includes some perennials.
Catalog costs \$.35. Ships.
61. Alex J. Summers, 14 I. V. Willets Rd. W., Roslyn, N.Y. 11576.
Specializes in *Hosta*. Extensive list. Minimum order \$20.00.
Ships.
62. Sunnyslope Gardens, 8638 Huntington Dr., San Gabriel, Calif.
91775.
Specializes in Chrysanthemums of all types including hardy
garden varieties. Ships.
63. Thomasville Nurseries, Inc., P.O. Box 7, Thomasville, Ga. 31792.
Extensive listing of *Hemerocallis*. Ships.

64. Thon's Garden Mums, 4815 Oak St., Crystal Lake, Ill. 60014.
Specializes in Chrysanthemums. Profusely illustrated color catalog. Ships.
65. Top O' The Ridge, 100 NE 81st St., Kansas City, Mo. 64118.
Extensive listing of Peonies and Iris. Ships.
66. Martin Viette Nurseries, Northern Boulevard (25A), East Norwich, Long Island, N.Y. 11732.
Probably the most extensive listing of perennials in this country. Exceptional lists of *Astilbe*, *Hosta*, ferns, grasses, herbs, *Hemerocallis*, *Iris*, *Phlox*, *Paeonia*. Does not ship.
67. The Wayside Gardens Co., Mentor, O. 44060.
Catalog costs \$2.00 but price is refundable on orders over \$15.00. May be worth the price for color pictures alone. Extensive list of perennials of all kinds, also trees, shrubs, and vines. Ships.
68. Weston Nurseries, East Main St., Rte. 135, Hopkinton, Mass. 01748.
Retail only, does not ship, but carries one of the most extensive selections of perennials in the Boston area. Also complete line of trees and shrubs.
69. White Flower Farm, Litchfield, Conn. 06759.
Extensive list of perennials, shrubs, bulbs, etc. Catalog published spring and fall costs \$3.00 but price is refundable on orders totaling \$15.00. Catalog is a handbook in itself and gives good descriptions and cultural directions. Ships.
70. Gilbert H. Wild and Son, Inc., Sarcoxie, Mo. 64862.
Specializes in Peonies, Bearded Iris, and *Hemerocallis*. Extensive lists. Catalog \$1.00. Profusely illustrated in color. Ships.

WHOLESALE NURSERY SOURCES FOR HERBACEOUS PERENNIALS

(The following nurseries do not deal directly with the general public. Do not attempt to order plants from them. If a plant you wish to obtain is available only from one of these suppliers, have your local nurseryman order it for you.)

- A — Bluebird Nursery & Greenhouse, 515 Linden St., Clarkson, Neb. 68629.
General list of herbaceous perennials.
- B — Bluemount Nurseries, Inc., 2103 Blue Mount Rd., Monkton, Md. 21111.
Extensive list of perennials of all kinds, including ornamental grasses.
- C — Carroll Gardens, Westminster, Md. 21157.
Extensive list of perennials of all kinds. Separate retail catalog.
- D — Cunningham Gardens, Waldron, Ind. 46182.
Chrysanthemums, ground cover plants, Clematis.
- E — Hauser's Superior View Farm, Bayfield, Wis. 54814.
General list of perennials. Includes selection of named forms of Russell Hybrid Lupines.

- F — Iverson Perennial Gardens, RR 1, Box 177, Palatine, Ill. 60067.
General listing of perennials.
- G — The Joseph F. Martin Company, Inc., 1500 W. Jackson St., P.O. Box 189, Painesville, O. 44077.
General list of perennials and ground covers. Extensive list of Chrysanthemums.
- H — Mount Arbor Nurseries, P.O. Box 129, Shenandoah, Ia. 51601.
Primarily a grower of trees and shrubs, but offers a selection of herbaceous perennials, including Peonies.
- I — Springbrook Gardens, Inc., 6776 Heisley Road, Mentor, O. 44060.
Extensive list of perennials. Strictly wholesale, but Springbrook's retail mail order outlet is Garden Place.
- J — Jack Vermeulen Nurseries, Route 1, Holland, Mich. 49423 or P.O. Box 296, Saugatuck, Mich. 49453.
Perennials, ground covers, dwarf shrubs.
- K — Walters Gardens Inc., P.O. Box 137, 96th Ave. at M-21, Zeeland, Mich. 49464.
Extensive general list of perennials.
- L — Weller Nurseries Company, P.O. Box 1111, Holland, Mich. 49423.
Extensive list of perennials of all kinds. Particularly good list of Phlox. Also, ground covers and Clematis.
- M — Dale Wild, Sarcoxie Nurseries, Inc., Peony Fields, P.O. Box. 306, Sarcoxie, Mo. 64862.
Specializes in Peonies, Iris, and *Hemerocallis*. Extensive lists.
- N — Yoder Brothers Inc., Barberton, O. 44203.
Extensive catalog of Chrysanthemums and other plants for the commercial grower.





In Mulch Display Beds at the Case Estates, 20 different mulches suitable for use in herbaceous or shrub borders are on view in small rectangular beds. In addition, many perennials that have not been included in the Low Maintenance Garden may be seen here.

Low Maintenance Perennial Garden of the Arnold Arboretum at the Case Estates, Weston, Mass. Herbaceous perennials requiring a minimal amount of maintenance have been selected with care for this garden. They are displayed in free-form beds among shrubs that have attractive shapes, colors, or textures, giving the garden interest at every season of the year.



Achillea 'Coronation Gold'

A SELECTION OF PERENNIALS AND THEIR SOURCES

Acanthus species — Distributed by a few nurseries, but not hardy in our area without considerable winter protection.

Achillea**Yarrow, Milfoil, Sneezewort
Daisy Family (Compositae)**

Some members of this genus of the Daisy family are easy to grow, will live on in spite of considerable neglect, and are very hardy. All adapt well to poor garden soils. In fact, average to poor soil somewhat on the dry side is best for them; rich or moist soil conditions promote weak growth and inferior flowers. The ability to withstand drought in open, sunny locations and the finely textured, pungent, fernlike foliage which remains in good condition throughout the growing season are other points in their favor. Never plant any of this group in the shade.

Those called the Yarrows (mainly varieties of *A. filipendulina*, *A. millefolium*, and *A. 'Taygeta'*) blossom for several weeks, and the flowers are excellent for cutting or drying; but beware of the claim in catalogs that they "bloom from June to the end of September." Recurrent flowering in this group is possible, but best results can only be achieved by faithful attention to the removal of the faded flowers to prevent seed formation.

A. filipendulina (syn. *A. eupatorium*) — Fernleaf Yarrow — Of value, but the named selections which follow have bigger, brighter flowers or are smaller in stature. The numerous small flowers of this group are yellow and are densely grouped in flattened saucer-shaped heads (corymbs) up to 4 to 6 inches across.

The species grows to a height of 3 to 4 feet. Plants may require staking unless given full sun and dry soil, especially if grown in a windy place. The grayish leaves are dissected and fernlike; blossoms appear in late June to mid-July, with recurrent flowers until September. Very drought-resistant with no insect or disease problems. Fernleaf Yarrows should be divided in spring after the fourth year to maintain vigorous growth. They are effective when planted either singly or in a group of three, 10 to 12 inches apart.

Sources: 3,4,46,68; L

A. *filipendulina* 'Gold Plate' — Largest and showiest of the group. Plants grow to 4 to 4½ feet with corymbs up to 6 inches across. Flowers bright yellow. Essential to have in a relatively dry place and away from strong winds to avoid staking. Especially fine for cut flowers. Culture same as for the species. Space 12 to 15 inches apart or as a single specimen.

Sources: 28,58,60

A. 'Coronation Gold' (*A. filipendulina* × 'Clypeolata') — Lower growing than *A. filipendulina* (2½ to 3 feet) and less likely to require staking. Mustard-yellow flowers and pleasing, finely divided, gray-green leaves. Long succession of flowers if seed formation is prevented. Culture and spacing the same as for the species.

Sources: 13,24,32,57,66,67,70C; I,J,K,L

A. 'Taygeta' — Lowest growing of the Yarrows recommended here, about 1½ feet. Handsome silvery leaves not as finely divided as those above. Flowers pale yellow, blooming over the same long period as the others. Culture the same; space in a group of three, 10 to 12 inches apart.

Sources: 24,66,69; B,L,T

A. 'Moonshine' — Selected form of *A. 'Taygeta'*. Flowers are a deeper, canary-yellow. Otherwise the same.

Sources: 3,24,32,49,66,67,68,69; C,I,K

A. *millefolium* — Milfoil or Common Yarrow — The species is a common weed of waste places and lawns where the soil is infertile; it is of questionable value in the perennial garden. The flowers are off-white. The selected forms which have flowers ranging from deep pink to rosy-red are, however, of interest, but must be placed second in value when compared to the usefulness of the varieties of *A. filipendulina* and *A. 'Taygeta'*. The flowers are borne in the same corymb-type inflorescence, but smaller to 2½ to 3 inches across, and the leaves are finely divided. Plants are about 1½ to 2 feet tall when in flower. Blossoming time is late June, July, and into September if the old flower heads are removed. These have a tendency to spread more than the other Yarrows; but if the soil is not rich, they cannot be classed as invasive. Full sun and a dry planting site are necessary. Somewhat ineffective as single specimens, they should be planted in groups of three about 12 inches apart, at the front of the garden. Staking will not be required, but division after the fourth year is recommended.

A. millefolium 'Crimson Beauty' — Flowers rose-red. 18 inches tall.

Sources: 13,66; C

A. millefolium 'Fire King' — Flowers deep rose-red. This is probably the most handsome of the *A. millefolium* cultivars. 18 inches tall.

Sources: 32,67,68,69

A. millefolium 'Red Beauty' — Flowers red. Plants 18 inches tall.

Sources: 24,39,66; B,I

Achillea ptarmica — Sneezewort — All varieties not recommended for low maintenance. Require division every other year; in some situations, annually to maintain the clumps in good condition. Become invasive if not restrained by division. Flowers excellent for cutting.

Cultivars available include:

A. ptarmica 'Angel's Breath' — Double white flowers.

Sources: 24,66,67,68; I,J,K,L

A. ptarmica 'Perry's Giant' — Double white flowers.

Sources: 13; C

A. ptarmica 'The Pearl' — Double white flowers.

Sources: 3,24,43,46,69; I,L

The following are sometimes listed by suppliers of perennials, but are better suited to the rock garden.

A. ageratifolia — Greek Yarrow — Flowers white. Plants 2 to 4 inches tall.

Sources: 66,69

A. ageratifolia var. **aizoon** (listed in catalogs as *Anthemis aizoon*) — Superior to the species. Flowers white. Plants 6 inches tall.

Sources: 3,24; I

A. tomentosa — Woolly Yarrow — Bright canary-yellow flowers; woolly gray-green leaves. Plants 10 inches tall. Spreads very rapidly.

Sources: 3,13,24,39,66; C,I

A. tomentosa 'Moonlight' — Less invasive than the species. Flowers lighter yellow in color.

Sources: 49,66

A. × 'King Edward' (*A. clavenae* × *A. tomentosa*) — Flowers, primrose-yellow; woolly, gray-green leaves. Plants 8 inches tall.

Sources: 24; I



Aconitum napellus — *Aconite Monkshood*

Aconitum

**Aconite, Monkshood, Wolf's Bane
Buttercup Family (Ranunculaceae)**

Plants which prefer to be left alone and yet do not outgrow their welcome must be considered valuable. When they also display attractive, glossy foliage throughout the season and provide conspicuous blue or purple flowers which are excellent for cutting, they deserve to be widely grown. Monkshoods qualify on all counts.

Attention is focused from time to time on the poisonous nature of these plants. Although it is true that no portion should be eaten, it is unlikely that humans would find occasion to taste either the leaves or roots. The tuberous roots are particularly virulent and could be confused with Jerusalem Artichokes or other root vegetables, however. For this reason, Monkshoods never should be grown near the vegetable garden; it also would be prudent not to plant them in areas frequented by small children.

Monkshoods are very hardy. They blossom in August and September, a time when most other plants with blue flowers have gone by, and the vertical effect, similar to that of Delphiniums, is particularly welcome. They require a fairly rich soil to which liberal amounts of compost have been added. If plants are grown in full sun, the soil must be moist, (not wet); drying out will check the growth and cause stunting. Aconites often do best in partial shade, or where they are exposed to full sun for only part of the day; however, they soon will decline in vigor if grown near trees providing root competition. Whatever the spot chosen, watering in really dry periods of the summer will be beneficial.

Clumps are easily divided either in early spring or autumn, but the plants are slow to increase and can be left for many years before division for rejuvenation, or to relieve crowding, will be necessary. About the only fault that can be found is that some of the taller varieties will require staking to prevent toppling from winds or rain. If the proper conditions can be provided, Monkshoods possess so many other good traits that this can be tolerated in a low maintenance situation.

Monkshoods are best seen as individual specimens planted about 2 feet from their nearest neighbors. According to variety, they are suited to the middle or rear of the border.

A. carmichaelii (syn. *A. fischeri*, the old name by which this is listed in catalogs) — Azure Monkshood — Grows to 2½ feet in sun and up to 3½ feet in shade, and is one of the lower varieties. Flowers pale blue from mid-August to mid-September, on stems strong enough to be self-supporting. Leaves large, smooth and lustrous, three-parted, with attractively divided segments. Sources: 3,13,24,32,69; C,I

A. carmichaelii var. *Wilsonii* (syn. *A. fischeri* var. *Wilsonii*, the old name by which it is listed in catalogs) — Tallest of the group, towering to 6 to 8 feet depending on location; must be staked, otherwise easily toppled by wind or rain. Best sited at rear of the border. Violet-blue flowers during most of the month of September. Sources: 24; I

A. carmichaelii var. *Wilsonii* 'Barker's Variety' — Grows 4 to 5 feet, and requires staking. An excellent color form, bright violet-blue or amethyst-blue flowers from late August to mid-September. Sources: 24,69; I

A. napellus — Aconite Monkshood — Flowers may be variable from blue to violet. Has probably the most attractive, finely divided foliage of the group. Plants 3½ to 4 feet in height and may require some staking. Blossoms earlier than most in August and early September. This is said to be the most poisonous species. Sources: 4,32,57

A. napellus var. *bicolor* — Considered to be better than the species because of the two-toned appearance of the flowers. Outer edges are bright blue and fade to white in the center. Leaves as finely divided as the species. Plants 3½ to 4 feet tall and may require staking. Source: 32

A. napellus 'Spark's Variety' — Flowers deep violet-blue, on spikes 3 to 4 feet tall; they appear in August and last well into September. Secondary spikes extend the flowering season, but plants are likely to require staking. Sources: 13,24,46,69; C,I

Adenophora

**Ladybells, Garland Bellflower
Bellflower Family (Campanulaceae)**

A much underrated genus of the Campanula family. The plants closely resemble the Campanulas or Bellflowers and to a non-botanist are virtually indistinguishable. The following appears to be the only species presently offered by dealers in perennials.

A. confusa (usually listed in catalogs as *A. farreri*) — Native to China. Flowers deep blue on 30-inch spikes for a relatively long time in July and August. Highly resents division or disturbance of any sort, is long-lived and very hardy. Quite sturdy and will not require staking. Does poorly in a dry soil and requires full sun. Plant at the middle of the border, either singly or in groups of three spaced 12 inches apart.

Sources: 24,69; I

Aethionema

**Stonecress
Mustard Family (Cruciferae)**

Frequently seen in catalogs which feature perennials, but best suited to hot, dry areas of the rock garden.

Ajuga

**Bugle, Bugleweed
Mint Family (Labiatae)**

Numerous varieties are offered, but are not recommended for the herbaceous border as they spread rapidly and soon become invasive — especially in the lawn where they are a great nuisance.

Alchemilla vulgaris

**Lady's Mantle
Rose Family (Rosaceae)**

This is a low growing plant suitable for the front of the border and does equally well in sun or in partial shade. It does not like dry soils, but otherwise is undemanding.

Although not outstanding, the yellowish-green or chartreuse flowers in July on stems to 18 inches are interesting and unusual subjects, either fresh or dried in small bouquets. The palmately-lobed, 3 to 4-inch-wide leaves are handsome throughout the growing season. They are somewhat hairy and rounded, and the lobes are creased like the segments of a fan.

Clumps will last in good condition for many years, but by the third or fourth year will have enlarged sufficiently so that division for purposes of increase is possible, either in early spring or autumn. For best effect, plant in groups of at least three, spaced 10 inches apart. Larger groupings are effective as ground cover.

Sources: 24,69; I

A. alpina — Too diminutive for the perennial garden, but a choice subject in the rock garden. Grows to a height of 4 to 6 inches.

Sources: 49,57

Althaea rosea

Hollyhock

Hibiscus Family (Malvaceae)

Although Hollyhocks are short-lived perennials (often best treated as biennials), they seed in so easily that plantings almost always perpetuate themselves. This tendency may make them unsuitable for well-groomed formal gardens, but most low maintenance situations should have a plant or two. Demonstrating their permanence is a spot in the Arnold Arboretum at the far side of Bussey Hill where the old Bussey Mansion once stood; the building was torn down over thirty years ago and today a mound of earth remains which is crowned in summer with Hollyhocks, and in spring with Snowdrops and Crocuses.

All that is required for successful cultivation of Hollyhocks is a well-drained soil of average fertility, and a site in full sun. Seedlings in unwanted places are easily controlled if discarded when young. The main enemy of Hollyhocks in our area is the Japanese Beetle. Also, Hollyhock rust is frequently a problem. This is a fungus disease which produces large orange spore cases on the leaves. A combination of these two problems produces very unsightly foliage and is the principal reason that Hollyhocks should be used sparingly.

Hollyhocks attain heights of 5 to 8 feet, and thus are suitable for the rear of the sunny garden. The flowers are borne all along the tall spikes and appear in July and August. They may be either single or double. The doubles seed just as freely as the singles, but after several years they will revert to single-flowered types.

It is perhaps easier, and certainly less expensive, to start a Hollyhock planting from seeds, but most all the varieties are obtainable as started plants from the usual mail order sources.

A. rosea — single-flowered forms — The following sources list these in a mixture of colors including red, pink, apricot, copper, yellow and white, etc.

Sources: 3,39,68,69; E



Hollyhock leaves disfigured by Japanese Beetles and Hollyhock Rust disease.

A. rosea — double forms — The following sources list these in separate colors.

Sources: 28,46,66; C,E,F,J

A. rosea — double forms — The following sources list these in a mixture of colors

Sources: 24,25,28,30,60,69; C,I

The following are named strains or cultivars, all having double flowers:

A. rosea 'Chaters Double' — Full range of colors. Chaters Hybrids also include single-flowered forms, but they seldom are available from nurseries.

Sources: 14,23,58,68; A,B,E,K,L

A. rosea 'Newport Pink' — Double pink flowers.

Sources: 24,60; E,I



A. rosea 'Pompadour' — Another double strain including all the range of colors. Petals tend to be crinkled, with a single row of outer petals surrounding the usual double "half-ball" of petals.
Source: 67

A. rosea 'Powderpuff Hybrids' — Very double flowers, often with longer flower spikes than the 'Chaters Double' forms.
Sources: 3,14,24,28,68,69; A,I

***Alyssum saxatile* Basket-of-Gold, Goldentuft Alyssum, Madwort**
Mustard Family (Cruciferae)

Commonly seen in rock gardens displaying its bright yellow blossoms on 12-inch stems in April or early May, Goldentuft Alyssum can be recommended for low maintenance borders only if the soil is dry and approximates rock garden conditions. Plants assume a coarse, sprawling habit in response to rich or moist soils, or shady conditions. It is best to encourage new growth by cutting back the stems to about half their length after flowering. If *Alyssum saxatile* is to be used in the herbaceous border, the two compact varieties discussed below should be given preference. They are best seen at the very front of the garden in groups of two or three planted 10 to 12 inches apart.
Sources: 14,23,37,39,46,54,67

A. saxatile 'Citrinum' — Flowers lemon-yellow, contrasting well with the silvery leaves.
Sources: 3,13,66,69; B,C,J,K

A. saxatile 'Compactum' — Neater, slower growing than the species, and will not require division for a number of years. Flowers the same bright yellow as the species, contrasting well with the silver foliage.
Sources: 3,13,66,67,68,69; A,B,C,J,K,L

A. saxatile 'Compactum Flora-plena' (frequently listed as *A. saxatile* 'Flora Plena') — Double-flowered compact form; flowers brighter yellow than the preceding cultivar, but not produced as freely as in the species.
Sources: 13,32,66,67,69; C

A. saxatile 'Silver Queen' — Lemon-yellow flowers which are most attractive against the silvery leaves.
Source: 68

Althaea rosea — The single form of Hollyhock growing in a nearly wild state at the far side of Bussey Hill in the Arnold Arboretum. Photo: P. Bruns.

Amsonia tabernaemontana **Amsonia, Willow Amsonia**
Dogbane Family (Apocynaceae)

An American plant native from Pennsylvania to Florida and Texas, this has been neglected by gardeners and yet is one of the easiest plants to grow.

Amsonia is very hardy, insect and disease-resistant, slow-growing and never invasive. It does almost equally well in moist or dry soils, is easily transplanted in spring or fall, never needs staking, does well in full sun or partial shade (perhaps a little better with some shade), and the foliage remains in excellent condition throughout the growing season. The tough stems are quite resistant to wind and the plant will thrive in seaside gardens.

Few plants possess so many virtues, so perhaps *Amsonia* may be excused if it is not the showiest plant in the border when in blossom. The clusters of small star-shaped flowers appear for two weeks at the end of May and into June and are an attractive steel-blue color, quite unlike the blue of any other perennial except some varieties of *Echinops*.

Plants grow to a height of 2 to 3 feet and form clumps about 1½ to 2 feet wide. Because they do not produce a great show of color, they are best seen as single specimens or small groups near the front or toward the middle of the border. Clumps remain in good condition for many years so division, except for purposes of increase, is unnecessary. Another native species, *A. salicifolia*, is quite similar in appearance and also may be in the trade listed as *A. tabernaemontana*.

Sources: 1,3,24,49,57,66,69; I

(Source number 66 lists an early and a late flowering form as well as the species.)

A. ciliata — Even less frequently grown than *A. tabernaemontana*, but equally worthy. Much lower growing, to 18 inches.

Source: 50

Anaphalis yedoensis **Japanese Pearly Everlasting**
Daisy Family (Compositae)

This is a close relative of our own native *A. margaritacea*, but more suitable for the perennial garden. The pearly white, button-like flowers are profusely borne in clusters 2 inches wide on 2-foot stems. They are conspicuous from mid-July until

September, and both the flowers and silver foliage are excellent for cutting and drying. Plants are of a compact, bushy habit. They will grow in any well-drained soil in full sun, and are particularly useful in hot or dry areas. Best at the front of the garden, they will hold their own as single specimens or in groups of three planted about 10 inches apart. Division usually is required after the fourth year.

Sources: 24,67; I

***Anchusa azurea* (syn. *A. italica*) Italian Alkanet, Italian Bugloss
Borage Family (Boraginaceae)**

Beautiful but demanding, some plants are best admired in other people's gardens; perhaps Italian Bugloss is such a plant. It blooms for a long period and has flowers of true-blue, a color which is always welcome. Not particular as to soil, it must be well watered in periods of drought. Plants grow from 4 to 6 feet tall and require no staking, but are coarse and bristly; after flowering, the foliage becomes very unattractive. A secondary, lesser blooming period is encouraged if the plants are cut back. They invariably start to deteriorate after the second year (sometimes the first), and must be divided. They also have a very bad habit of seeding in all over; a distinct nuisance, especially if the garden is small.

Source: 66

The following varieties all require frequent division and are equally prone to seeding in:

***A. azurea* 'Little John'** — Lowest growing variety, about 1 to 1½ feet; deep blue flowers.

Sources: 24,69; I

***A. azurea* 'Loddon Royalist'** — Another good blue variety. Not over 3 feet.

Sources: 66,67

***A. azurea* 'Pride of Dover'** — Flowers medium blue. Unlike the others requires staking; height 4 feet.

Source: 69

***A. azurea* 'Royal Blue'** (also listed as 'Dropmore Royal Blue') — Smaller in stature; to 3 feet. Large deep gentian-blue flowers.

Sources: 13,24,69; C,I

Anchusa mysotidiflora — This is the old name for a most valuable garden plant; it still is listed this way in most catalogs. See *Brunnera macrophylla*.



Anemone × *hybrida* *cultivar*

Anemone* × *hybrida

Japanese Anemone

Buttercup Family (Ranunculaceae)

Anemones are a large garden group. Some belong in the general category of bulbous plants; others are for rock or wildflower gardens. The varieties of *A. × hybrida* (mainly *A. hupehensis* var. *japonica* selections) and one variety of *A. vitifolia* — the Grape-leaved Anemone — are of interest in this discussion. We hesitate to give them unqualified approval, for in our area they will not be hardy if the proper circumstances cannot be provided. If they can, these Anemones will reward the gardener for many years without much further attention. So, although most of the group cannot be recommended for low maintenance situations, we would suggest that you try a plant or two if your conditions approximate those described. If you succeed for three years, you ought to try more.

Anemones require a rich soil well supplied with humus, but it must be very well drained. Partial shade is recommended for best performance but plants will often tolerate exposure to full sun. If the soil dries out in summer, irrigation should be provided. The worst enemy in winter is an overly wet soil; this, more than anything else, will lessen the plants' ability to survive the dormant season. In the Boston area, a winter mulch of straw, oak leaves, or evergreen boughs is advisable, but not until the ground is thoroughly frozen. Set out potted plants in the spring so they will have sufficient time to become established before winter.

The Japanese and Grape-leaved Anemones blossom in white or shades of pink from late summer to mid-autumn. The handsome dark green leaves are deeply lobed and on established specimens form dense mounds up to 2 feet wide. The flowering stems reach a height of 2 to 3 feet depending upon variety. The plants increase slowly in size and require several years to form full-sized clumps. When circumstances are to their liking, they will remain in good condition for many years and dislike being disturbed. Best seen in groups of three, they may be planted about 1½ feet apart.

***A. × hybrida* 'Alba'** — Single white flowers 2 to 3 inches across, with only one ring of petals.

Sources: 13,24,32,66,67,68; B,C,I

***A. × hybrida* 'Max Vogel'** — Semidouble, rose-pink.

Sources: 24; I

***A. × hybrida* 'Prince Henry'** — Large double, deep purplish-pink.

Source: 32

***A. × hybrida* 'Profusion'** — Semidouble deep rose-pink. Plants somewhat dwarf, about 2 feet.

Source: 67

***A. × hybrida* 'Queen Charlotte'** — Semidouble deep pink.

Sources: 24,32,58,66; I

A. × *Hybrida* 'September Charm' — Single silvery-pink shaded rose-mauve.

Sources: 13,24,32,66,67; B,C,I

A. × *hybrida* 'September Sprite' — Single rose-pink.

Sources: 13; C

A. × *hybrida* 'Whirlwind' — Semidouble white.

Sources: 13,32,66,68; C

A. *hupehensis* var. *japonica* — Flowers rose-pink to purple.

Sources: 66,68

Anemone pulsatilla (or, properly, *Pulsatilla vulgaris*) — Pasque Flower — Listed by many suppliers of perennials, but is better suited to the rock garden).

A. *vitifolia* 'Robustissima' — Grape-leaved Anemone — This is the hardiest of the autumn Anemones. Plants have survived in the Low Maintenance Garden of the Arnold Arboretum with only minimal winter protection and where the soil was too moist for other varieties. Very similar in appearance to the Japanese types and very free-blooming with light pink flowers. Sources: 13,24,66,67; C,I

Antennaria

**Pussytoes, Cat's-Ear
Daisy Family (Compositae)**

Diminutive plants of the Daisy family, well-suited to the rock garden or for planting between paving stones; however, of little value in the perennial border.

Anthemis tinctoria

**Golden Marguerite, Golden or Ox-Eye Camomile
Daisy Family (Compositae)**

Unfortunately, this plant and its several cultivars cannot be considered for low maintenance situations. They require division every other year or clumps will tend to develop a dead area in the center. Most all varieties require staking as well; otherwise, this is a fine plant for hot, dry areas with sandy soil where most other plants fail. In such situations it will thrive and produce masses of flowers in July, continuing until September if the faded blossoms are removed. The yellow flowers are Daisy-like and make excellent subjects for cutting; the leaves are aromatic. Golden Marguerite grows to about 2½ feet.

Sources: 46; E

A. tinctoria 'Beauty of Grallagh' — Deep golden-yellow flowers on bushy, 2½ to 3-foot plants.
Source: 32

A. tinctoria 'E. C. Buxton' — Lemon-yellow flowers. 2½ feet.
Source: 32

A. tinctoria 'Kelwayi' — Deep yellow. 2 feet.
Sources: 68,69; B,J,L

A. tinctoria 'Moonlight' — Pale yellow.
Sources: 13,24,32,57,58,66,67; C,I

Other types offered:

A. biebersteiniana — Flowers bright yellow. Best as a rock garden plant. 10 to 12 inches.
Sources: 66,68

A. sancti-johannis — St. John's Camomile. — Flowers 1½ to 2 inches across, bright orange. Same uses as *A. tinctoria*. 2½ feet.
Source: B

Aquilegia

Columbine

Buttercup Family (Ranunculaceae)

Unless one can provide excellent drainage, Columbines are apt to be transitory in nature and of no value to those who have little time to continuously replace plants. We cannot disregard them altogether, though, for if they find conditions to their liking, they seed in on their own and seedlings in unwanted places are not difficult to control. Many of the popular long-spurred cultivars possess a decided tendency to degenerate into all sorts of "mongrels" when seeding occurs.

Columbines have another bad feature which must be taken into consideration if space is limited. Often they suffer from leaf miners, insects which eat their way through the tissues of the leaves and produce characteristic "tunnels." These pests are difficult to control, and when the flowers are gone, one is left with a not-too-beautiful display of debilitated foliage.

There are a large number of species and cultivated strains from which to choose. The Alpine sorts are difficult and should be avoided by the novice. *A.* 'Mrs. Scott Elliot' and *A.* 'McKanna's Giants' are old favorites of vigorous growth and fairly easy culture.

Flowers appear in late May and June, and, depending upon variety, are between 1½ to 4 inches across, mainly in shades of red, yellow, pink, white, blue, or lavender. The sepals, which surround the five true petals (arranged like a cup), may be the same color, or contrast in color, to the petals. A spur varying in length from ½-inch to 6 inches is attached to the back of each petal. Culture is fairly simple. As mentioned above, good drainage is a necessity, but plants will not tolerate an overly dry soil.



Leaves of Columbine marred by leaf miners.

Either full sun or light shade is satisfactory, but a shady condition will prolong the flowering season somewhat. Leaf miner can be controlled to some degree by spraying with Malathion in early and mid-May; however, we recommend that all affected plants be removed and burned.

A selection of the many varieties available includes:

A. chrysantha — Golden Columbine — Native to the Rocky Mountains and the Southwest. Shades of yellow. Long spurs. Flowers 2 to 3 inches across. Plants 3 feet high.
Sources: 3,24,46,68,69; I,L

A. chrysantha 'Silver Queen' — A white-flowered selection of the above. Flowering season is longer than most of the others.
Sources: 3,69

A. coerulea — Colorado Columbine — Another species native to the Rocky Mountains; the State Flower of Colorado. Blue sepals,

creamy-white petals, slender spurs 1½ inches long. Plants 2½ feet tall. Quite short-lived in hot locations.

Sources: 3,24; I

A. flabellata — Fan Columbine — From Japan. White flowers tinged with lavender-rose in late April, and light green foliage. 15 inches high.

Source: 4

A. flabellata 'Nana Alba' — Good dwarf form of the above with pure white flowers. 6 inches high and suited to the very front of the border. Frequently used in rock gardens.

Sources: 3,4,68

A. 'Copper Queen' — Flowers copper-red.

Sources: 24; I

A. 'Crimson Star' — Petals white, tinged with red. Long crimson-red sepals and spurs.

Sources: 3,4,24,32,37,68,69; I,K,L

A. 'Dragonfly Hybrids' — Includes the normal range of colors. Flowers are long-spurred. Plants semidwarf, to 18 inches.

Sources: 4,24,68; B,E,I,K

A. 'McKanna's Giant Hybrids' — The most popular strain. An All-American Seed Trial winner in 1955. Extensive color range, very sturdy growth. The large flowers have spurs 4 inches and more long. 2½ to 3 feet tall.

Sources: 4,13,14,23,24,25,28,30,32,37,46,53,58,66,68,69; A,B,C, E,F,G,I,J,K,L

A. 'Mrs. Scott Elliot Hybrids' — Now of somewhat lesser value than the preceding, but used to be the standard varieties. Flowers somewhat smaller, but the colors tend to be deeper and range through shades of crimson, purple, blue, and pink. 2½ to 3 feet tall.

Sources: 25,53; J,L

A. 'Rose Queen' — Pure white petals, rose-colored sepals.

Sources: 3,32,37,69; K,L

Arabis

Rock Cress, Wall Cress Mustard Family (Cruciferae)

Many types offered by dealers in perennials, but best suited to hot dry areas in rock gardens.

Arenaria

Sandwort Carnation Family (Coryophyllaceae)

Mat-forming plants, some almost mosslike in appearance. Best suited to the rock garden; sometimes used as ground covers.

Armeria**Thrift, Sea-Pink
Leadwort Family (Plumbaginaceae)**

Most members of this group are traditional rock garden subjects, but they may also be of value at the very front of the border if the proper soil conditions can be provided. They all possess neat, compact tufts of evergreen foliage. *A. maritima* and its cultivars are very low-growing, mat-forming plants useful where the soil is poor and dry. Rich or overly moist soil conditions will cause the mats to rot at the centers and become unsightly after about the second year. The varieties of *A. plantaginea* and *A. pseudoarmeria* are taller, to 2 feet, and find suitable positions a bit further back from the front. All have globular heads of flowers. The basic shade is pink; some are intense pink. All varieties may be left in place until the clumps begin to deteriorate, normally after the fourth year. They all should be given a position in full sun with sharp drainage at the roots.

A. maritima — Sea-Pink, Common Thrift — Forms dense, rounded mats 3 to 4 inches tall, about 1½ feet wide, and has blossom stems up to 10 inches. Flowers light pink to rose-pink; the species is somewhat variable.

Sources: 14,68

A. maritima* var. *alba — The white-flowered form of the above species. It is considered quite choice.

Sources: 24,66,67,69; I

***A. maritima* 'Brilliant'** — Bright pink.

Sources: 32,66

***A. maritima* 'Laucheana'** — Plants very tufted, to 6 inches tall. Flowers intense rose-pink in dense heads.

Sources: 13,24,39,66,67,69; B,C,I,J,L

***A. maritima* 'Vindictive'** — Deep rosy-red.

Sources: 24; I

***A. plantaginea* 'Bee's Ruby'** — Cultivar of Plantain Thrift — Taller, to 1½ to 2 feet when in flower. Blossoms bright ruby-red in June and July. Effective when massed as a group of three or more planted about a foot apart.

Sources: 13,24,66; C,I

***A. pseudoarmeria* 'Glory of Holland'** — Cultivar of Giant or Pink-ball Thrift (usually listed under the old species name *A. cephal-*



Armeria maritima — At the very front of the border, this five-year-old specimen has been effectively combined with Coral Bells and Peonies.

otes) — To 2 feet when in blossom. Flower heads large, deep pink.

Sources: A,J,K,L

A. 'Royal Rose' — Rich pink flowers on 15-inch stems.

Source: 67

Artemisia

Artemisia, Wormwood, Mugwort Daisy Family (Compositae)

Silver or gray foliage can be used in the perennial border in a number of ways, either to provide notes of accent or as a contrast to such colors as blue, red, pink, or yellow.

In our area, for really reliable gray foliage plants, we must depend upon the Artemisias. Even of this large group, for low maintenance situations we can recommend only two: one short,

and one tall. In addition to the gray foliage, all of the group have finely divided aromatic foliage. Flowers are yellowish or white, and insignificant for the most part. The plants perform best in light, well-drained soils, even infertile ones; all should be planted in full sun.

A. abrotanum — Southernwood, Old Man — This is actually a slender shrub since the stems are woody. It grows from 3 to 5 feet tall depending on the fertility of the soil and is suited to the middle or rear of the border. The leaves are grayish-green, much divided and pleasantly aromatic. Plant Southernwood singly or, for strong accents, in groups of three, about 1½ feet apart. Division is not necessary, but cutting back from time to time may be required to keep plants vigorous.

Sources: 13,24,32,39,46,69; C,I

A. schmidtiana 'Silver Mound' — Angels Hair — This has become one of the most popular plants listed in catalogs of perennials. It grows to a height of 12 inches and forms a rounded mound about 1½ feet in diameter. The bright silvery foliage is of the greatest value in border foregrounds. If *A.* 'Silver Mound' is planted in too rich a soil, growth is lush and the mound of foliage flops and opens in the center; therefore, it would be best to use this plant where hot, sunny conditions prevail and soil conditions are relatively poor.

Sources: 3,13,14,20,24,25,28,30,39,46,49,58,59,66,67,68,69; A, B,C,G,H,I,J,K,L

All the following are of value in our area when silver-foliaged plants are needed. They require frequent division, usually on an annual basis, or some will deteriorate and others will become invasive.

A. absinthicum — Wormwood — 2 to 4 feet tall. Leaves white and silky. Spreads quickly.

Sources: 13,24,39; C,I

A. albula 'Silver King' (frequently listed in catalogs as 'Silver King,' rather than by the species name) — Ghost plant — 2 to 3 feet tall. Silvery-gray leaves.

Sources: 13,14,24,25,32,39,59,66,67,68; B,C,I,K,L

A. albula 'Silver Queen' — Similar to the preceding, but the leaves are more glistening, intense silver.

Source: 66



Artemisia schmidtiana 'Silver Mound' — The distinctive shape and finely textured foliage (shown below) can be used for effective accents in front of taller growing perennials or shrubs.



A. frigida — Fringed Sagewort — Silvery leaves, deeply cut. 8 to 12 inches tall.

Sources: 13,32,49; A,C

A. lactiflora — White Mugwort — 4 feet tall. Fine-textured leaves. About the only *Artemisia* valued for its flowers which are creamy-white in August and September.

Sources: 13,24,32,49; C,I

A. stelleriana — Beach Wormwood, Dunesilver, Dusty Miller, Old Woman — Native along our coast. Beautiful silvery-white leaves. Plants about 2 feet tall.

Sources: 13,14,24,32,46,66,68,69; C,I

Aruncus sylvester

Goats-Beard Rose Family (Rosaceae)

This is a very desirable subject for the rear of the border, especially in low maintenance situations, and it is strange that it is so infrequently offered by nurserymen. Resembling a giant Astilbe, its attractive compound foliage is topped with large, showy plumes of white flowers in mid-June. We emphasize that this is a large plant. It grows to 5 feet tall with a spread of over 3 feet; but despite the height, staking is not required. Tolerant of a wide range of soil conditions, it can be grown almost anywhere. In situations away from the border, Goats-Beard could compete with shrubbery in the landscape. It deserves to be more popular.

Sources: 29,66

A. sylvester 'Kneiffii' — Similar to the species except that it has more finely-cut foliage and is therefore more graceful in appearance. Unfortunately we are unable to locate a mail-order source.

Source: 66

Asclepias tuberosa

Butterfly Weed, Pleurisy Root Milkweed Family (Asclepiadaceae)

This should be tried in every garden where the soil is poor or sandy and dry, particularly if a place in full sun can be given. This native American is hardy and showy in flower, has a long life, will never outgrow its allotted space, has no insect or disease problems, and once established requires almost no attention. This is the type of description we immediately suspect as

Asclepias tuberosa — *Butterfly Weed*



"phony" in advertisements for some plants, but if you do not encourage Butterfly Weed with a rich or moist soil, excellent results should be expected.

It grows from 2 to 3 feet tall with hairy stems and leaves which are pointed. The orange flowers in midsummer are borne in umbels and last for about two weeks. They are followed by the typical Milkweed-type pods which are attractive in dried arrangements.

Butterfly Weed develops a tap root, so once established it is very difficult to move. Young potted plants obtained from nurseries may be planted either in the spring or autumn. They are slow to start in the spring so careful cultivation will be necessary until the new growths appear; division is not recommended.

Sources: 1,3,5,7,13,14,24,25,27,29,30,39,46,57,58,60,66,67,68,69; A,B,C,I,J,K,L

Aster

Hardy Aster, Michaelmas Daisy, Starwort
Daisy Family (Compositae)

The requirement of annual division for some, and every other year for most of the rest, removes this large and valuable group from most low maintenance borders — even though the plants are easy to grow otherwise. Because Asters are of great value from late summer to late autumn, and particularly because they are much easier than Chrysanthemums, many gardeners certainly will wish to have a few varieties. Long admired in Europe, particularly in Britain, Asters have not always been as popular here — probably because the parents are common "weeds" along our roadsides. In fact, *A. novae-angliae* the New England Aster, *A. novae-belgii*, the New York Aster, and *A. ericoides*, the Heath Aster are the principal parents of the modern cultivars, although a few other species are involved.

Apart from frequent division, culture is fairly simple: spring is the best time for planting; full sun and a well-drained, light soil are best; ordinary fertility will do. In humid summers, the leaves of some cultivars are susceptible to mildew and rust diseases. Height, according to variety, ranges from under a foot to about 6 feet. Those over 2 feet may require staking. This is best done in the European manner by placing twiggy branches 2½ to 3 feet high (4 feet for the taller sorts) amongst the plants while the growth is still low. As the plants grow, these twigs will provide support, but will be largely hidden by the foliage.

The following is but a sampling of the many varieties available:

A. 'Autumn Glory' — Rich red. 3½ to 4 feet tall.
Sources: 13,67; C

A. 'Countess of Dudley' — Clear pink. 9 to 12 inches tall. September.

Sources: 68; K

A. 'Crimson Brocade' — Crimson-red. 3 feet tall.

Sources: 24,59,67,69; I

A. 'Eventide' — Deep violet-blue. 3½ feet tall.

Sources: 3,13,28,32,58,59,66,67,68,69; C,H,K

A. 'Finalist' — Strong violet-blue. 2½ to 3 feet tall. Very late flowering, October to mid-November.

Source: 67

A. × *frikartii* 'Wonder of Stäfa' (usually listed as *A. frikartii* [sic.], this is a hybrid between *A. thomsonii* and *A. amellus*) — Bears lavender-blue flowers from July to October, even during periods of drought. In our area frequently requires the protection of a winter mulch to be hardy, especially if the soil is at all wet; usually needs staking too.

Sources: 3,13,14,24,32,44,58,59,60,66,67,68,69; B,C,G,I

A. 'Harrington's Pink' — Pure pink; mid-September blooming. 4 feet tall. Requires less frequent division; probably would be one of the best for a low maintenance situation.

Sources: 3,13,24,59,66,68,69; B,C,I,L

A. 'Patricia Ballard' — Fully double, pink; when flowers are young has a yellow "eye" in the center as do the other varieties. 3 feet tall. September to October.

Sources: 32,59,67,68,69; H,K

A. 'Violetta' — Rich deep blue. 2 to 3 feet tall with a rounded habit. September.

Sources: 67,68

A. 'White Lady' — Good pure white. 2 to 3 feet tall. September to October.

Source: 68

A. 'Ypres' — Rosy-pink. 1½ feet tall. September.

Source: 68

Astilbe

Astilbe, False Spiraea, False Goat's Beard Saxifrage Family (Saxifragaceae)

Astilbes have become an almost indispensable feature of waterside plantings, and thrive where soils are rich and moist in the summer. Their main enemy, however, is a wet soil in winter. The plants are heavy feeders and exhaust the soil around them, hence they may need to be divided at frequent intervals (every three years) if maximum flowering is to be ob-

tained. The roots are shallow so at planting time it is not necessary to re-work the soil deeply, but ample amounts of fertilizer and organic matter should be added.

In a low maintenance situation, *Astilbes* may remain for much longer than three years before they are divided. The flower spikes will not be as large, or the plants as vigorous, but an acceptable display still can be had, especially if they receive a top dressing of a 5-10-10 fertilizer each spring. Best in partial shade, the plants may be situated in full sun if the soil does not dry out easily.

The flowers themselves are very small, but are displayed in June and July in dense, erect or arching panicles about 2 feet tall. There is a wide range of colors, often in vivid pastel hues, from purple to red, pink, or white. Foliage ranges in color from green to bronzy green and is dissected and decidedly attractive. Many of the cultivars are classified under the general name *A. × arendsii* and result from the breeding efforts of George Arends of Ronsdorf, Germany, who crossed several species and produced a dazzling array of colors.

The following is but a selection of the many available types:

A. 'Avalanche' — White. 18 inches. Deeply cut, dark green foliage.

Sources: 24,32,69; I,L

A. *chinensis* var. *pumila* — Dwarf Chinese Astilbe — Very dwarf, only 6 to 8 inches. Unlike the others, has a creeping habit and blooms in August. Flowers lavender-pink.

Sources: 13,32,49,66; C

A. 'Deutschland' — Pure white. 24 inches.

Sources: 24,58,66,67,68,69; B,I,L

A. 'Europa' — Clear pink. 1½ to 2 feet. Foliage dark green.

Sources: 66,68,69; B

A. 'Fanal' — Deep garnet-red. 1½ feet. Foliage dark reddish-green.

Sources: 13,23,25,58,66,68,69; C,L

A. 'Irrlicht' — Pure white. 1½ to 2 feet.

Sources: 13,49,66,68; C

A. 'Mainz' — Deep rose. 18 to 20 inches.

Sources: 24,49,68; I,J



Astilbe × *arendsii* 'Deutschland'. Photo: P. Bruns.

A. 'Montgomery' — Deep red. 2 feet.

Sources: 20,24,49,66; B,I,L

A. 'Peach Blossom' — Pale peach-pink. 30 inches.

Sources: 13,24,25,58,66,68,69; C,I,L

A. 'Queen Alexandra' — Soft rose. 2 to 2½ feet.

Sources: 3,49,68; L

A. 'Red Sentinel' — Rich, intense red. 2 feet.

Sources: 3,13,66,67,68,69; B,C,J,L

A. 'Rheinland' — Carmine-pink. 2 to 2½ feet.

Sources: 24,32,67,69; B,I,J,L

Baptisia australis

Blue or False Indigo Pea Family (Leguminosae)

It has been suggested that our native *B. australis* might be desirable for those who have difficulties with Delphiniums and Lupines. If grown specifically for this purpose, it may prove to be a rather poor substitute; but the plant is of value in many other ways.

It does not require a rich soil, has no serious insect or disease problems, will live on for a number of years in one spot, and will not become invasive. It is tolerant of full sun or partial shade. The indigo-blue flowers are borne in terminal racemes on stems 3 to 4 feet in height. After flowering in June, attractive inflated black pods develop which are as handsome on the plants as they are in dried arrangements. *Baptisia australis* is also a member of that group whose foliage remains in good condition all summer. Although the plants are tall and suited to the middle or rear of the border, they will not require staking. One author has suggested that this may be just the plant for the person who says, "I can't grow a single thing."

Sources: 3,4,13,24,45,46,58,66,67,68,69; C,I

Belamcanda chinensis

Blackberry Lily, Leopard Flower Iris Family (Iridaceae)

Often described as not reliably hardy in colder regions, this somewhat unusual member of the Iris clan is perfectly hardy in Boston in our experience; in fact it has escaped and formed

colonies in the wild in some parts of New England. In Western Massachusetts or northern New England it will require the protection of a mulch in winter. This plant seems to have been much more popular in bygone days; it deserves a comeback.

Out of flower, the plant resembles a large *Iris*, about 3 feet in height. The flat, star-shaped, 2-inch flowers are orange spotted with red, an exotic combination for northern gardens. They appear in late July and August on stems 3 to 4 feet tall. Also interesting are the shiny black clusters of seeds which somewhat resemble a raspberry in shape and appear after the seed pods burst. These persist for a long time and are useful in winter dried arrangements. Self-seeding may occur, but young plants are easily removed if not wanted.

Culture is simple. A place in the sun and well-drained soil are about the only requirements; soggy soil conditions in winter may prove fatal. About the only insect problem is caused by the *Iris* Borer which may occasionally attack the fleshy rhizomes. For control, see *Iris*. Blackberry Lilies do not lend themselves well to mass effects; they are seen best as single specimens placed somewhere between the front and the middle of the border. Division will not be necessary for a number of years.

Sources: 1,4,25,27,39,58,69; B

Bergenia

***Bergenia*, Megasea, Pig Squeak Saxifrage Family (Saxifragaceae)**

Bergenias have uses in many garden situations due to their tolerance of a wide variety of conditions: sun or shade, moist or dry soil, which either can be moderately rich or moderately poor. They are recommended most frequently for use in rock gardens, along stream banks, or as ground covers for small areas. They are low plants, not over a foot in height, so their use in a perennial garden would be restricted to the very front. Where perennials are displayed in combination with shrubbery, *Bergenias* can be very useful as edging. They are prized for the glossy green, 8 to 10-inch, rounded, cabbage-like leaves which are evergreen with reddish tints in the winter. The flowers are of secondary interest; in our area they may not be produced after a severe winter or if the plants are in exposed locations. The flowers are borne on short stems just above the foliage and, depending on variety, are pink, rose-pink, or white.

Little care is necessary. If the soil is a dry one, plants can



Bergenia cordifolia — Heartleaf *Bergenia*

go for many years before they will require division; but this may be necessary after about the third or fourth year if plants are encouraged into excessive growth by very fertile soil conditions. They spread by rhizomes on the surface of the ground; as these grow away from the center and the clumps expand, bare spots may result. Division, leaving a short piece of the rhizome (3 to 4 inches is enough), is best done in the spring so that the new plants will have the benefit of a growing season to produce new roots and become established by winter. Single specimens appear lonely, so plant several in a group about 1 foot apart.

B. cordifolia — Heartleaf *Bergenia* — Very hardy, the most commonly-planted species. Leaves are rounded, somewhat heart-shaped and toothed at the margins. Flowers reddish-pink. Sources: 13,32,59,66,67,68,69; B,C,J

B. cordifolia* var. *purpurea — Flowers purplish-pink.

Source: 66

B. crassifolia — Leather Bergenia — Less commonly grown in our area. Leaves more oval than round. Flowers reddish-pink.

Source: 32

B. crassifolia* var. *orbicularis — Leaves broader than the preceding. Flowers pink.

Sources: 66,68

We have not tried some of the other species and interesting hybrids offered by a few nurserymen on the West Coast, so are unprepared to comment on their hardiness.

Betonica grandiflora — See *Stachys grandiflora*

Boltonia

Boltonia, False Camomile, False Starwort
Daisy Family (Compositae)

Similar in appearance to, but taller than, most of the Fall Asters, they have a much more limited range of flower colors. Culture is the same. Division is required annually or every other year. Staking is mandatory.

B. asteroides — Grows to about 6 feet high. Lilac or purple flowers.

Sources: 24,66,68; I

B. latisquama — Violet Boltonia — Grows to about 6 feet high. Flowers bluish-violet and showier than those of *B. asteroides*.

Sources: 4,46

Brunnera macrophylla

Dwarf Anchusa, Siberian Bugloss
Borage Family (Boraginaceae)

A very easy plant to grow, especially in light shade where the soil is somewhat moist. In April to early June it is of value for the branched racemes of small, clear blue, starlike flowers similar to those of *Anchusa* or Forget-me-nots. Throughout the rest of the growing season the dark green 6 to 8-inch heart-shaped leaves provide an excellent foliage effect. The leaves increase in size from spring until midsummer, at which time they give the most effective display. Plants range in height



from about a foot to 18 inches and may be planted singly or in a group of three or more placed about 15 inches apart; they are suitable for use as a deciduous ground cover in a shady moist area. It will be many years before the clumps open at the center and require division.

Sources: 3,13,23,24,32,49,66,67,68,69; B,C,I,J,K,L

Campanula

Bellflower

Bellflower Family (Campanulaceae)

This is a large and varied group with many members which are of great value in the rock garden; some, in the perennial garden; and one which is such a pestiferous weed it never should be in any garden.

The principal sorts for the perennial garden have similar, easy cultural requirements. They will tolerate either full sun or partial shade. The soil should be well drained and need be of only average fertility. All are best seen in groups of about three rather than as single specimens. Under most conditions, staking of the taller varieties will not be necessary. Clumps need not be divided until deterioration starts; this will, in most cases, be about every four years. Spring rather than fall planting, is usually recommended. Removal of the seed heads will prolong the flowering and prevent undesirable self-seeding.

C. persicifolia (listed in some catalogs as *C. persicifolia* 'Grandiflora Coerulea') — Peach-leaved Bellflower, Peach Bells — We place this species and its cultivars first in value for the low maintenance garden. They grow to a height of 2 to 2½ feet and bloom in July. The several erect stems from the base of the plant bear a profusion of cup-shaped flowers in shades of blue or white and are excellent for cutting. It is said that the plants are best divided every other year, or every third year, to keep them vigorous; in our experience they can go for at least four years before this may be necessary. The species has light blue flowers. Sources: 3,4,13,24,46,53,67,69; C,I,K

C. persicifolia var. *alba* (this is listed by some nurseries as 'Alba Grandiflora') — Same as the above, but the flowers are white.

Sources: 3,13,24,66,67,68,69; C,I,K

C. persicifolia 'Blue Gardenia' — Flowers deep silvery-blue, double.

Source: 32

Brunnera macrophylla — Siberian Bugloss. Photo: P. Bruns.

***C. persicifolia* 'Landham's Giants'** — Assortment of shades of blue and white.

Sources: 24; I

***C. persicifolia* 'Telham Beauty'** — Often considered one of the best, but may require more frequent division. Large, single, 3-inch porcelain-blue flowers.

Sources: 32,66,68; B

***C. persicifolia* 'White Pearl'** — Flowers white, double.

Sources: 24,32; I

C. glomerata — Clustered Bellflower, Danesblood — In a low maintenance situation these are recommended only for positions in full sun; in shade they spread rapidly by runners and will become invasive. Plants are 1½ to 2 feet tall and bloom in late spring and early summer. The flowers are borne in dense upward-facing clusters in shades of blue, purple, or white. Axillary flowers open after the terminal head has finished.

C. glomerata* var. *acaulis — The lowest-growing variety, not exceeding 8 inches. Quite large, purple flowers.

Sources: 13,66; C

***C. glomerata* 'Crown of Snow'** — Large white flowers in dense clusters.

Source: 69

***C. glomerata* 'Joan Elliott'** — Deep violet-blue flowers.

Sources: 24,67; I

C. glomerata* var. *superba — Large heads of deep violet flowers.

Sources: 13,66,69; C

C. lactiflora — Milky Bellflower — Of easiest culture. Blooms from late June to the beginning of August with large blue, 1-inch flowers on 3-foot stems. The species itself appears not to be widely available at present, but the cultivar which follows is excellent in every respect.

***C. lactiflora* 'Pritchards Variety'** — This includes a range of colors from pale to deep blue.

Source: 70

C. latifolia — Great Bellflower — Another excellent species. It is very showy in blossom, and produces terminal racemes of violet-colored flowers in June and July. Plants are many-stemmed, to a height of 3 feet.

Source: 66

C. latifolia 'Brantwood' — Flowers deep violet.

Sources: 24,67; I

C. latifolia 'Macrantha' — Bright purple flowers which are up to 2½ inches across. The plant is very showy and grows taller than other cultivars of this species.

Source: 68

The following have merit in the rock garden, or are biennials; one is included as a warning. We cannot recommend them for general purposes in the perennial border, but occasionally the lower growing sorts may be of use at the very front.

C. carpatica — Carpathian Harebell, Carpathian Bellflower — Beloved by rock gardeners, this forms neat clumps of foliage less than 6 inches high. The 2-inch blue or white cuplike flowers on 6 to 8-inch stems appear over a long period in June and July. The species has blue flowers.

Sources: 3,4,13,24,46,67,68,69; B,C,I,K,L

C. carpatica var. *alba* — The white-flowered form of the species.

Sources: 3,49,66,67,68,68; B

C. carpatica 'China Doll' — Lavender flowers.

Sources: 13,24,69; A,C,I,J,K

C. carpatica 'Blue Carpet' — Deep blue flowers.

Sources: 32,66

C. medium var. *calycanthema* — The well known Cup and Saucer form of Canterbury Bells. A biennial, it requires replacement each year to keep a succession. Often raised from seed; some nurseries sell started plants.

Sources: 13,66; C,J,L

C. rapunculoides — Rover Bellflower, False Rampion — In our area this is one of the most noxious weeds that can invade a garden. Although rather handsome in flower, it spreads freely and has become widely naturalized. The roots are fleshy, and the smallest portion left behind in weeding is capable of regenerating new plants which take over large areas in a relatively short time. Once established, the Rover Bellflower is nearly impossible to eradicate without resorting to herbicides, a chancy business in a perennial garden. Although a few nurseries offer this species for naturalizing in wild gardens, it is better enjoyed in waste places where it belongs.

C. rotundifolia — Harebell, Bluebells of Scotland — A diminutive species, not much over 10 to 12 inches when in flower. Flowers are small, nodding, and bell-like. In the species they are blue.

Sources: 13,24,46,67,68,69; C,I

C. rotundifolia var. *alba* — The white-flowered form of the species.

Source: 69

Cassia marylandica**Wild Senna****Pea Family (Leguminosae)**

Here is another infrequently used native American plant which has great potential in the perennial border and is excellent for low maintenance situations. It blooms in August, with a profusion of bright yellow flowers in 3-inch clusters, on stems 3 to 4 feet tall. Some large border plants have a coarse appearance, but Wild Senna is extremely fine-textured and the compound leaves remain in attractive condition throughout the season. If the plant did not bloom at all, it still would be valuable on this account.

Plants will grow for many years before division is necessary; it is easily accomplished in early spring. Positions in either full sun or partial shade are equally satisfactory, but wet soil conditions should be avoided. There are no insect or disease problems; staking is never necessary. When grown in a perennial border, Wild Senna should be placed well to the rear. It is unfortunate that sources of supply are so limited.

Sources: 24; I

Catananche coerulea**Cupid's Dart, Cupid's Love Dart****Daisy Family (Compositae)**

These plants, particularly the named color selections, require division every year or every other year in order to perpetuate the form and prevent the numerous inferior self-sown seedlings from taking over. Also, they are short-lived if not frequently divided. A sunny position is demanded; soggy soil in winter is fatal and even under the best of conditions hardiness cannot always be assured. The flowers are a good blue with deeper blue centers, and somewhat similar in appearance to, but smaller than, Wild Chicory. The ends of the petals typically look as if they have been cut off with pinking shears. The leaves are silvery-green; the flowers are excellent for cutting and drying. Of rather frail habit, plants must be massed in groups of three, or preferably more, to get a good effect. Flower stems reach a height of about 2 feet.

Sources: 3,13,14,24,66,69; C,I,K,L

C. coerulea* var. *alba — Silvery-white flowers.

Source: 69

***C. coerulea* 'Blue Giant'** — Pale blue flowers.

Source: 67

Centaurea

Daisy Family (Compositae)

This group will survive all sorts of neglect if the right conditions can be given: a sunny aspect, and soil of ordinary fertility which is well drained, especially in winter. All plants of this group can endure considerable drought. With one exception, they can go four years or longer before division will be necessary. Spring planting is usually recommended. They all are very hardy.

C. dealbata — Persian Centaurea — Lilac to purple, deeply fringed flowers in mid-July and August, sometimes into autumn. The foliage is more finely textured than most other Centaureas, and somewhat white below. Best seen in groups of three, planted about a foot apart. 2 feet tall.

Sources: 13,24; C,I,K,L

***C. dealbata* 'Sternbergii'** — Superior to the above. Petals are deeply notched and bright purple, surrounding clear white centers. Plants are quite bushy and blossom from the end of June into September.

Sources: 13; C

C. macrocephala — Globe Centaurea, Yellow-Hardhead — Grows to 3 to 4 feet and is considered to be coarse in appearance, partly because of the large, stiff leaves which are borne sparingly. The golden-yellow flowers appear in 3-inch Thistle-like heads in June and July. Best seen toward the middle or rear of the garden alone rather than in groups, this is a plant to consider when a bold effect may be wanted.

Sources: 13,24,58,67; C,E,I,J

C. ruthenica — Ruthenian Centaurea — Grows to 3 feet and is yellow-flowered, but not as coarse in appearance as the above. The leaves are deeply lobed, giving a somewhat finer-textured appearance.

Sources: 24; I

C. montana — Mountain Bluet or Knapweed, Hardy Bachelor's Button, Perennial Corn Flower — The most popular of the group, but requires division every other year or it will spread rapidly and become unkempt in appearance. Its tendency to self-sow can be a nuisance in some circumstances. Deep Corn-flower-blue flowers, 2 to 3 inches wide, on 2-foot stems.

Sources: 3,13,14,24,46,67,68; B,C,E,I,J,K,L



Centaurea montana — *Mountain Bluet*

Cerastium

**Snow-in-summer, Starry Grasswort
Carnation Family (Caryophyllaceae)**

Of great value for their handsome silver foliage, these plants spread rapidly; annual division will be necessary to keep them in check on all but the very poorest or driest soils. Best left to dry, exposed situations in the rock garden where they can romp; or to the top of walls which are set against banks of soil.

C. biebersteinii — Taurus *Cerastium* — Considered the choicest species; its spreading is not as offensive as the *C. tomentosum* clan. Silvery-gray leaves and white flowers which are larger than those of *C. tomentosum*.

Sources: 24; I

C. tomentosum — Snow-in-summer — 2-foot creeping stems, very silvery foliage. Covered with white flowers in June. Highly invasive; may be difficult to eradicate when well established.

Sources: 14,46,68; A,B,J,L

Ceratostigma plumbaginoides — *Blue Leadwort*

C. tomentosum 'Columnae' — A dwarf form of the above. Only 4 to 6 inches tall.

Sources: 13; C,K

C. tomentosum 'Silver Carpet' — Another dwarf selection. 6 inches tall.

Source: 67

Ceratostigma plumbaginoides

Blue Leadwort

Leadwort Family (Plumbaginaceae)

The Latin name is quite a mouthful and this may account for the nearly universal use in catalogs of the old name *Plumbago larpentae*. This is a desirable little plant which produces an abundance of $\frac{1}{2}$ -inch blue flowers in late summer. Its maximum height is 6 to 8 inches, and when left undisturbed, plants form clumps 12 to 18 inches across. In fall the leaves turn a bronze-green and this color intensifies as the weather becomes cooler.

Blue Leadwort is not always reliably hardy in the Boston area, especially when soil conditions are wet in winter. A light covering with a winter mulch is advisable here, and mandatory further north.

Spring is the only planting time recommended. Plants are very late to appear in the spring and one may be fooled into thinking they have not survived the winter; thus early cultivation must be done with care and it may be wise to have some sort of a small marker to indicate the plants' location in a large garden.

Sources: 3,13,24,28,30,32,37,49,66,67,68,69,70; A,B,C,G,H,I,J,L



Chelone**Turtlehead****Figwort Family (Scrophulariaceae)**

These are excellent plants for light shade where the soil is moist; they increase rapidly to form a large clump and division may be necessary by the fourth year. Otherwise, they are simple to grow and have no insect or disease problems. The maximum height is 3 to 4 feet. Best planted as single specimens instead of in a group because of their robust nature. Plants possess shiny dark green leaves, and the pink or white flowers are about an inch long in short terminal clusters appearing in August or September. The shape of the flower is supposed to resemble that of a turtle's head.

C. glabra — White Turtlehead, Snakehead — Flowers generally white, sometimes tinged with rose. 2 feet.

Sources: 39,43

C. lyoni — Pink Turtlehead — Flowers pink to rose-purple. 3 to 4 feet.

Sources: 39,46,68

C. obliqua — Rose Turtlehead — Flowers deep rose. 2 feet.

Sources: 29,66



Chelone lyoni — Pink Turtlehead



The soft rose-colored flowers of Chelone lyonii combine well with the bright blue of Ceratostigma plumbaginoides in foreground.

Chrysanthemum morifolium**Hardy Chrysanthemum, Mum
Daisy Family (Compositae)**

If any degree of perfection whatever is desired, these are probably the least recommended of all plants for a low maintenance situation, and little space can be devoted to them here, other than to list the faults. Annual division is necessary because healthy growth and flowering diminish after the first year. Mums are gross feeders and require frequent top-dressings during the growing season. Most all, except the low cushion varieties, must be pinched back several times during the earlier part of the summer to encourage branching and heavy flowering. Some of the large-flowering types should have the secondary flower buds removed. Spraying or dusting every two weeks with a complete pesticide often will be necessary. Although some varieties are quite hardy in our area, most are not reliably so and require the protection of a light mulch, or are better overwintered in a cold frame. If the homeowner with little time wishes a bright autumnal display, it would be far better to purchase a few mums in pots; almost every garden center, florist, or roadside stand features them in the fall.

Chrysanthemum coccineum**Pyrethrum, Painted Daisy
Daisy Family (Compositae)**

From the standpoint of low maintenance, the Painted Daisies are one group in the *Chrysanthemum* clan which can be recommended. *Pyrethrum* is the old generic name; they are commonly called Pyrethrum and are so listed in catalogs rather than under *Chrysanthemum*.

They are of particular value for their bright, Daisy-like single or double blossoms in vibrant shades of pink to red or white, in June and early July. Another asset is the bright green, finely-divided foliage.

Painted Daisies perform best in a fairly rich soil that is well supplied with humus. They squarely belong in the group whose hardiness is lessened when the soil is soggy during the winter months, but are perfectly hardy in Boston when good drainage is assured. Best in full sun, they will tolerate light shade during part of the day. They have no important pest or disease problems and will not require staking; division will be necessary after the fourth year. Planting or dividing is always done in spring and the protection of a winter mulch is advisable the first winter following. Height ranges from about 9 inches to 2½ feet so Pyrethrums are suited either to the front or middle of the border. They are effective singly, but better in groups of three planted about a foot apart.

Of the over 20 cultivars currently available, the following is but a selection to demonstrate the color range. Plants do not take kindly to long periods in the mail, so are better obtained from local sources where possible.

C. coccineum 'Buckeye' — Deep rose-red, flecked white, semi-double. 2 feet.
Sources: 24; I

C. coccineum 'Crimson Giant' — Bright red, 4-inch, single flowers. 3½ feet.
Sources: 13,24,32; C,I

C. coccineum 'Eileen May Robinson' — Salmon-pink, single. 2 feet.
Source: 66

C. coccineum 'Helen' — Soft light pink, double. 2½ feet.
Sources: 20,24,32,66; I,J

C. coccineum 'Robinson's Crimson' — Crimson, single. 2 feet.
Sources: 24,67,69; B,I,J,L

C. coccineum 'Snowball' — Double white. 2½ feet.
Sources: 20,66; J

Chrysanthemum maximum

Shasta Daisy
Daisy Family (Compositae)

The requirement of division to maintain vigor every second or third year, and their somewhat unreliable hardiness in our area causes us, grudgingly, to place these in the "not recommended for low maintenance" category.

The mostly white, single or double Daisy-like flowers are excellent for cutting and appear from June until frost on plants 2 to 4 high. Shasta Daisies prefer rich soil which is moist but well drained in the summer, and not soggy in winter. Most cultivars will be hardy in this area if this condition can be met. The single cultivars are best in full sun, but the doubles will be disappointing unless they receive partial shade. They are effective singly or in groups of three or more planted about a foot apart. Plants in seemingly good health may sometimes wilt and die for no apparent reason, especially in a wet summer. This demise is caused by Verticillium Rot, a fungus disease which attacks the roots. Sick plants should be discarded immediately.

Shasta Daisies are almost a necessity in the cutting garden, so, despite the problems, flower arrangers will probably wish to

try a few. This list is but a selection of the nearly 40 cultivars currently available:

C. maximum 'Aglaya' — Lace Shasta — Double white, petals very fringed. Robust and considered one of the hardiest. 2 feet.
Sources: 13,15,24,28,32,44,58,67; C,I,J,K,L

C. maximum 'Alaska' — One of the most popular; perhaps the hardiest. Single, white with a yellow center; typical Daisy flower. Cut the plants back after the first flowering has finished in mid-July and they will bloom again. 2 feet.
Sources: 3,23,24,25,37,46,53,58,67,69; A,B,E,F,I,K,L

C. maximum 'Cobham Gold' — Flowers cream-colored, with a gold flush. Large, double, with a high crest in the center. 2 feet.
Sources: 24,32; I,L

C. maximum 'Diener's Double' — Double white with frilled petals. 2 feet.
Sources: 37; B,E,

C. maximum 'Esther Read' — Double white. 18 inches.
Sources: 13,15,32,59; C,E,

C. maximum 'Horace Read' — A sport of *C. 'Esther Read'* but not as free-flowering — Larger double white flowers about 4 inches across.
Sources: 13,15,29; C

C. maximum 'Little Miss Muffet' — Quite dwarf, 14 inches high. Semidouble, white.
Sources: 3,13,24,32,49,58,66,69; C,I,J

C. maximum 'Majestic' — Single, very large (4 to 5 inches); white with a small yellow center.
Sources: 13,15,24,44,67; C,I,K

C. maximum 'Marconi' — Double white, up to 6-inch flowers with very frilled petals, long period of bloom. 2 feet.
Sources: 3,15,37,69; A,B,F,K,L

C. maximum 'Thomas Killin' — Double white with cream-colored crested center. 18 inches.
Sources: 13,24,67; C,I,J,K

Cimicifuga

Snakeroot, Bugbane, Cohosh Buttercup Family (Ranunculaceae)

These are stately plants 3 to 8 feet tall which, when well established, can be left alone almost indefinitely. The small white flowers are produced on long racemes well above the shiny compound leaves. Best used as single specimens at the middle or rear of the herbaceous border, Snakeroots adapt themselves

Cimicifuga racemosa — Bugbane or Cohosh. The spire-like effect is most welcome in the perennial garden in midsummer.



equally well to massing at the edge of a pond or stream, or even amongst shrubbery.

For best growth, a moist soil with a high organic content is necessary. If this condition can be provided, the plants may be grown in full sun; however, they are used more commonly in semishaded areas as they perform best in a cooler location. They will tolerate deep shade, but at the expense of best results.

C. dahurica — Dahurian Bugbane — Much-branched, it grows to a height of 4 to 5 feet. The creamy-white flowers appear in August and last into the fall.

Sources: 13; C

C. foetida (listed in some catalogs as *C. simplex*) — Kamchatka Bugbane — Much smaller, to 3 feet, and more branched from the base, with numerous spirelike spikes of flowers.

Sources: 13,66,68,69; C

C. 'Armleuchter' — A more vigorous selection of the preceding with somewhat larger flowers.

Source: 68

C. racemosa — Black Snakeroot, Cohosh, Bugbane — A native American, the most commonly grown species, and the tallest (5 to 8 feet depending on soil and location). Blooms in late June and the display is prolonged to early August by smaller lateral spikes of flowers from the main stem.

Sources: 13,14,26,27,46,66,67,68,69; B,C,

C. 'White Pearl' — Very compact, 3 to 4 feet tall. Pure white flowers.

Sources: 59,66,68

Clematis

Clematis

Buttercup Family (Ranunculaceae)

The numerous climbing woody varieties of *Clematis* are demanding when it comes to the proper conditions for good growth. The herbaceous kinds are somewhat less so, but few amateur gardeners know of their value. Although not as showy as the climbers, they bloom over a long period in the summer and, once established, become permanent additions to the garden. All provide flowers which are excellent for cutting, and when flowering is finished develop attractive, fluffy seed heads.

They require rich, well-drained soil and benefit from occasional applications of lime. Full sun or partial shade is satisfactory. They grow fairly large (3 to 4 feet tall) and a spacing of about 2 feet is necessary. Since they are slow to establish, gaps between plants may be filled with annuals for a few years. Like the climbers, herbaceous Clematis prefer cool soil conditions so a 2-inch covering of mulch is advisable in summer. They resent frequent cultivation around the roots; in fact, all lower parts of the plants are easily damaged.

C. heracleafolia* var. *davidiana — Blue Tube Clematis — The last of the herbaceous group to bloom, this bears tubular deep blue flowers in August and September. They are fragrant and produced in terminal and axillary clusters on 2½ to 3-foot-high stems which may require support. The foliage has a somewhat coarse appearance so it would be undesirable to feature this plant in the most prominent part of the border. Nevertheless, it is of value for the display of blue flowers so late in the season. Sources: 24,59,66,67; I

***C. heracleafolia* var. *davidiana* 'Wyvale'** — A selection of the preceding with deeper blue flowers. Sources: 24; I

***C. integrifolia* 'Coerulea'** — Solitary Clematis — Has 1½ inch porcelain-blue bell-shaped flowers. Although it attains a height of only 2 feet, the stems have a tendency to flop if not supported. Where staking is not done, allow plenty of room so that the plant will not crowd its neighbors. When given a moderately moist situation, or if watered during dry spells, it will bloom from June to August. Sources: 13,32,67; C

C. recta — Ground Clematis — Less handsome than its selections, and less frequently grown. Taller than the preceding two species (3 to 4 feet) and best near the rear of the border. Freely produces terminal and axillary clusters of ¾-inch fragrant, tubular white flowers in June and July. The species and the following cultivars or varieties require staking to prevent the plants from flopping at flowering time. Sources: 24; I

***C. recta* 'Grandiflora'** — Bears a profusion of white flowers in June and July. 3 feet. Sources: 66,69

C. recta* var. *mandshurica — The most commonly grown form of this species, it is valuable for its fragrant, tubular white flowers in June and July. Quite vigorous in growth so allow about 3 feet for it to spread.

Sources: 59,67

***C. recta* 'Purpurea'** — A selection with purplish-green foliage. Flowers white.

Sources: 24; I

Convallaria majalis

Lily-of-the-Valley Lily Family (Liliaceae)

Little need be said of this plant by way of description. It is popular because it is so undemanding and versatile. The ability to colonize restricts its use in the perennial garden where it may become a nuisance by usurping space. Where there is room for it to romp, few plants are hardier and more adaptable. Permanent, tolerant of most soil conditions except the extremes, it is suited to sun or shade, but does better with some shade. It should be kept in mind that Lily-of-the-Valley is poisonous in all parts, and that young children are attracted to the orange-red berries appearing in late summer and fall. These fruits should be removed. The common white-flowered form is easily available.

Sources: 3,13,14,20,24,27,32,37,43,44,57,58,59,66,67,68,69; A, B,C,I,J,K,L

***C. majalis* 'Flora Plena'** — Quite rare, double white form.

Sources: 32,66

***C. majalis* 'Rosea'** — Very pale pink.

Sources: 1,13,30,32,58,59,66; C

***C. majalis* 'Striata'** — The leaves have creamy-white stripes.

Sources: 32,66

Coreopsis

Coreopsis, Tickseed Daisy Family (Compositae)

A few members of this large genus are excellent for the low maintenance border; but some lack complete hardiness, behave as biennials, or are best seen naturalized in a wild garden. They all are sun lovers and prefer a light, sandy, well-drained soil.

Coreopsis verticillata — *Thread-leaf Coreopsis*

With the exception of *C. lanceolata*, division probably will be necessary after the fourth year.

Yellow Daisy-like flowers over long periods in the summer, and finely textured foliage are their best attributes.

C. auriculata 'Nana' — Dwarf Eared Coreopsis — A small spreading plant 4 to 6 inches tall, bearing numerous small bright orange-yellow flowers from June to August. Suited to the front of the perennial garden. Plant in a group of three spaced about 10 inches apart.

Sources: 3,66

C. lanceolata — Perennial Coreopsis — This and its cultivar following are the best for the low maintenance garden. It thrives for years in a sunny spot without needing to be divided. The bright yellow Daisy-like flowers are about 2 inches across, on stems 2 feet high. Blooms for most of the summer.

Sources: 27; B

C. lanceolata 'Sunburst' — An excellent cultivar of the above with large, bright, semidouble yellow flowers.

Sources: 24,60,66,67,68,69; E,F,I,J,K,L



C. verticillata — Thread-leaf Coreopsis — This often is found in catalogs under the name "Golden Shower." It makes large dense clumps about 2 feet tall, and 2 to 3 feet wide, and although the individual bright yellow flowers are small, they are freely produced throughout most of the summer among the finely textured leaves. Another good feature of this plant is its ability to withstand dry soil conditions.

Sources: 3,13,24,66,68; B,C,I,J,K,L

C. 'Baby Sun' — A hybrid, usually raised from seed but fairly uniform in its bright yellow flowers. 20 inches tall and compact in growth.

Sources: 3,13,69; A,C,J,L

C. 'Mayfield Giant' — Another hybrid which grows 3 feet tall with 3-inch bright yellow flowers in June and July.

Sources: 3; K

Delphinium

Delphinium, Larkspur Buttercup Family (Ranunculaceae)

Few plants can approach the Pacific Hybrid Delphiniums for their bold effect in the border. However, the whole Delphinium clan is finicky in nature and cannot be guaranteed as long-lived in our area even with ideal conditions of site and care.

The soil must be rich, well drained, and slightly alkaline. A position in full sun is preferred. Shady conditions lead to troubles with mildew, but plants can be affected by this in a sunny spot, too. Annual applications of a 5-10-10 fertilizer and a side-dressing during the growing season are necessary to produce vigorous growth. Staking the flower stems individually to prevent toppling is a must with the taller varieties. Plants should be cut back after the main period of bloom to induce a second flowering at the end of the season. Spraying with a fungicide and miticide at 10-day intervals during the growing season is frequently necessary to control mildew and cyclamen mites. The latter carry a blight disease which distorts the leaves and buds and causes them to turn black. Elaborate winter protection may be necessary. Sand or ashes placed around the crowns helps to prevent attack by slugs. After the ground has frozen, plants should be covered by a thick layer of hay or straw (2 to 3 inches). It often is safer to overwinter the plants in a cold frame.

In the few situations where Delphiniums prosper, they will live for many years and require division when the clumps have become large. This usually is after the third or fourth year. However, as a rule they are best treated as short-lived perennials, or biennials.

D. elatum — Common Delphinium, Candle or Bee Larkspur — These are the large-flowered types so prized for their 4 to 6-foot columns of densely packed blooms. Individual flowers may be 2 inches or more across. They come in many colors and may be single, semidouble or double; self-colored, or bicolor. Many have a central “eye,” often called a “bee,” usually of a contrasting shade or color. The parentage of the modern garden types is not well known but *D. elatum* is certainly the principal species involved.

In this country the *D. elatum* types commonly offered are the Pacific Hybrids. These are as good as, if not better than, any of the strains developed by the English breeders. (Those of English origin include the ‘Blackmore and Langdon Hybrids,’ available from: 69, 70; J, and the ‘Wrexham Hybrids,’ available from: 37; K.) All the cultivars which follow belong to the Pacific Hybrid group. Many nurseries offer them as plants grown from seed, and although they do reproduce relatively true, some variation from the descriptions offered here may be expected.

D. elatum ‘Pacific Hybrids’ — The following sources offer unnamed plants in a mixture of colors.

Sources: 16, 23, 28, 32, 68; J,K,L

D. ‘Astolat’ — Shades of lavender and pink, with a black or gold “bee” at the center.

Sources: 15,20,44,58,59,60,66,69; A,B,E,L

D. ‘Black Night’ — Shades of deep purple with a black “bee.”

Sources: 20,37,46,58,59,60,66,69; A,B,E,F,K,L

D. ‘Blue Bird’ — Shades of medium blue with a white “bee.”

Sources: 15,25,44,66,69; A,B,E,K

D. ‘Blue Jay’ — Shades of dark blue.

Sources: 15,59; E,K

D. ‘Elaine’ — Shades of pink to rosy-lilac with a white “bee.”

Sources: 3,13,32; C,E,K

D. ‘Galahad’ — Pure white, no contrasting “bee.”

Sources: 3,15,20,25,37,44,46,58,59,60,67,69; A,B,E,F,K,L

D. ‘Guinevere’ — Outer petals light blue, inner petals lavender, white “bee.”

Sources: 20,25,37,58,59,69; A,E,F,K,L

D. ‘King Arthur’ — Deep violet with a white “bee.”

Sources: 3,15,25,44,46,59,60,66,67,69; A,B,E,K,L

D. ‘Percival’ — Pure white with a black “bee.”

Sources: 59,66,69; E

D. ‘Summer Skies’ — Soft blue with a white “bee.”

Sources: 3,15,20,37,44,46,58,59,60,66,67,69; A,B,E,F,K,L

D. × belladonna — Garland Larkspur (Sometimes listed in garden books as *D. cheilanthum* var. *formosum*, but this is a garden race of mostly unknown parentage.) Garland Larkspurs differ from the hybrids in the *D. elatum* group in their open branching habit. They have numerous short spikes with a looser arrangement of flowers, and blossom for a longer period. They are quite susceptible to mildew problems and must be in a position where air circulation is good. Light blue flowers. Plants reach a height of 3 to 4 feet.

Sources: 3,13,59,69,70; B,C,J,K,L

D. × belladonna 'Bellamosa' — Dark blue-flowered form.

Sources: 3,67,68,69; B,J,K,L

D. × belladonna 'Casa Blanca' — Pure white-flowered form. A vigorous grower which attains a height of nearly 5 feet.

Sources: 13,24,25,29,67,68,69; C,I,K,L

D. × belladonna 'Cliveden Beauty' — Sky blue flowers. Plants 3 feet in height.

Sources: 24,28,67; I,L

D. × belladonna 'Lamartine' — Flowers deep purplish-blue. Plants 3 feet in height.

Sources: 13,28; B,C,

D. 'Connecticut Yankee' — A comparatively new race of hybrids which are exceptionally free flowering and form densely branched plants 2½ feet in height. The 2 to 2½-inch blossoms are loosely arranged on the spikes and have a color range including shades of blue, purple, lavender, and white.

Sources: 13,14,20,24,25,28,68,69; A,B,C,E,I,J,K,L

D. grandiflorum — (The species and its forms invariably are listed in catalogs as *D. chinense*) — Siberian or Bouquet Larkspur — Members of this group are best treated as biennials in our area. They bloom in late summer, have a slender branching habit, and grow to 1½ to 2 feet in height. The flowers are violet-blue or white.

Sources: 24,46; I

D. grandiflorum 'Album' — White flowers.

Sources: 24,69; I

D. grandiflorum 'Blue Mirror' — Gentian-blue flowers.

Source: 69

D. grandiflorum 'Cambridge Blue' — Rich light blue flowers.

Source: 69

Dianthus

Pink, Carnation

Carnation Family (Caryophyllaceae)

This is a genus which contains many garden varieties. Considered in relation to their stature, they fall into two fairly distinct groups. The shorter, mat-forming types require conditions

Dicentra spectabilis — *Bleeding Heart*

of excellent soil drainage and are best in the rock garden. Many of these thrive in the Boston area. The taller types are suitable for the perennial border, but are distressingly short-lived, or extremely intolerant of the hot, humid weather frequently experienced during the summer in our area.

Dicentra

Bleeding Heart, Lyre Flower Fumitory Family (Fumariaceae)

For permanence, the best of this group is *D. spectabilis*, the Bleeding Heart or Lyre Flower. It is a true aristocrat of the border for the short period when it is in bloom. A well-established plant forms a large clump 2½ feet tall and up to 2½ to 3 feet broad with arching stems bearing pink heart-shaped flowers in late May and June. It prefers a rich soil well supplied with organic matter and results are always best if light shade can be provided. Specimen plants are preferable to groupings because each requires a lot of room. If they are situated in full sun, the



foliage has a tendency to die down in the hot part of the summer, leaving a large gap in the border. For this reason Bleeding Hearts are frequently planted near *Gypsophila paniculata* (Baby's Breath). By the time the former is about to disappear, *Gypsophila* is ready to mask the gaps. Other plants which will act as fillers include *Hosta*, *Hemerocallis*, or even annuals. *Dicentra spectabilis* is a very long-lived plant which dislikes being disturbed. It is best planted only in the spring before new growth commences, and in a place where it can be left alone for many years.

Sources: 3,7,13,14,23,24,28,30,32,37,39,46,58,59,67,68,69; B,C,G,H,I,J,K,L

D. eximia — Plume or Fringed Bleeding Heart — This species is of great value for its long flowering period from May to August. The dissected leaves are grayish-blue, remain attractive throughout the growing season, and make a good contrast to the pink flowers. The flowers are a paler pink and smaller than *D. spectabilis*, but have the same overall heart-shaped form. *D. eximia* will not die back if planted in full sun, yet is perfectly adaptable to conditions of light shade. It grows from 12 to 18 inches tall, and is best seen in groups of three or more planted about a foot apart near the front of the garden. Plants may require division after the fourth year, but are best left alone until the clumps begin to deteriorate.

Sources: 1,3,7,13,24,28,37,39,46,57,58,66,68; B,C,H,I,J,K,L





Flowers of *Dicentra eximia*

Several cultivars are presently available which, in general, resemble *D. eximia* in habit of growth and have the same general cultural requirements. Their flowers range in color from pink to deep pink, or almost red, and some have a flowering period considerably longer than *D. eximia*. Confusion exists as to the exact parentage of some of these forms and they frequently are listed under the name *D. eximia*, but are hybrids involving *D. eximia*, *D. formosa* (Western Bleeding Heart), or *D. oregona*. They all grow to a height of about a foot. Those advertised to bloom intermittently through the summer should have faded blossoms removed at frequent intervals for best results.

D. 'Adrian Bloom' — Crimson-red flowers. Blue-green foliage. Forms large clumps, about a foot tall.
Sources: 13,24,29; C,I

D. 'Bountiful' — Deep pink flowers. Blue-green foliage. Produces intermittent blossoms in the summer after the main flowering period in May. Has another period of heavy flowering in early autumn.
Sources: 59,66,67

D. 'Luxuriant' — Flower buds cherry-red, flowers red. Green foliage. Blossoms intermittently until frost.
Sources: 57; K

Dicentra eximia — *Fringed Bleeding Heart*

D. 'Summer Beauty' — Deep rose flowers. Gray-green foliage. Blossoms into the summer.

Sources: 24,32; I

D. 'Valentine' — A new introduction, flowers described by the introducer as Spiraea-red. Recurrent blossoms until frost following the main blooming period in late April or May.

Source: 67

D. 'Zestful' — Deep rose flowers. Gray-green foliage. Blossoms through the summer.

Sources: 7,14,20; L

Dictamnus albus

Gas Plant, Dittany, Burning Bush Citrus Family (Rutaceae)

Dictamnus albus (usually listed in catalogs as *D. fraxinella*), is one of the most permanent perennials in the garden. The best treatment is simply to leave the plants alone, and they will increase in vigor as each year passes. In fact, the best way to ruin a good clump of *Dictamnus* is to divide it and attempt to re-establish the resulting plants elsewhere. For this reason, it is advisable to begin with young plants of seedling size, preferably started in pots. Even then it may take several seasons before they give the desired effect, but the results will be worth waiting for.

Although it will tolerate partial shade, a sunny location with moderately rich soil is best for the Gas Plant. Situations which remain wet for any length of time should be avoided, and the plant can be counted upon to withstand moderate periods of drought. Although it is slow to start, a well-grown specimen will take up a lot of room in the border and it is best to leave about 2 to 2½ feet in each direction for expansion. Annuals could be used to fill the gaps in the meantime. A well-grown Gas Plant will eventually attain a height of 3 feet, and is of value as a specimen plant in the background of the small garden, or as a middle-of-the-border subject, especially when combined with shrubs. Staking will never be necessary. The 2-inch flowers are grouped in terminal racemes and appear for about two weeks during June. The relatively short period of blossom has been listed as a disadvantage, but the handsome, pinnate leaves remain in good condition throughout the season and provide an excellent accent wherever the plant is placed. When crushed, bruised, or



Dictamnus albus — Gas Plant

even brushed against, leaves and stems emit a pleasant fragrance of lemons. The fruits remain on the plant well into the winter and provide interest long after the flowers have gone. They are very useful in dried arrangements.

The name Gas Plant or Burning Bush is derived from the fact that the plant exudes a volatile gas just below the flowers, and this can be ignited by a match without harm to the plant. A small blue flame of very short duration is produced, but conditions must be quite calm as the gas is easily dispersed by breezes. It is often stated that the best conditions for producing this phenomenon exist on calm sultry evenings when the plants are in full flower.

D. albus — Flowers pure white.

Sources: 3,4,13,24,32,46,59,67,69; C,I

D. albus* var. *purpureus (usually listed in catalogs as var. *ruber*) — Deep pink or purplish flowers with deeper colored veins.

Sources: 3,13,14,24,25,32,59,67,68,69; C,I

Digitalis

Foxglove

Figwort Family (Scrophulariaceae)

Well-loved for their spirelike stalks with pink, white, yellow, or rosy purple flowers in midsummer, most Foxgloves are biennials. They will often perpetuate themselves by self-sowing, but cannot be relied upon to do so in all situations. There are a few perennial species which are of quite easy culture, but they are not particularly showy and space should not be wasted upon them, especially in a small garden.

All Foxgloves prefer a location in light shade and a fairly fertile soil which does not dry out quickly during the summer. Soggy soil conditions in winter are usually fatal. Plants should be discarded as soon as the seeds are dispersed, as the dying foliage becomes unsightly by August.

D. grandiflora — Yellow Foxglove — Frequently listed in nursery catalogs by the old name, *D. ambigua*. It grows to a height of 3 feet and, although advertised frequently as a true perennial, is best treated as a biennial. The 2-inch pale yellow flowers have brown blotches in the throats, appear in July, and are not particularly striking.

Sources: 13,24,25,29,32,69; C,I,K

D. 'Mertonensis' — Showiest and most nearly perennial of all the types commonly available. One of the best for a low maintenance garden. The Strawberry-red flowers appear on 3 to 3½-foot stems in June and July.

Sources: 13,14,24,29,32,66,69; C,I

Digitalis purpurea 'Excelsior Hybrid'



***D. purpurea* 'Excelsior Hybrids'** — Most effective of the *D. purpurea* group because the flowers are borne all around the spike, rather than on one side. They come in many beautiful pastel shades of pink, mauve, yellow, and white with attractive deep mottling in the throat of each. They attain heights of 4 to 5 feet. The spirelike habit is most welcome in the garden during the month of June.

Sources: 13,24,68,69; A,B,C,E,J,K,L

***D. purpurea* 'Shirley Hybrids'** — The progenitors of the 'Excelsior Hybrids,' these come in the same array of colors, but the flowers are borne on one side of the spike only.

Sources: 13,23,24; C,E,I,K,L

***D. purpurea* 'Hyacinth Hybrids'** — Similar to the 'Shirley Hybrids' with a color range including white, shell-pink, and deep rose. Throats of the flowers are mottled with crimson or chocolate.

Source: 67

D. thapsi — Although native to Spain, this species is quite hardy and has good perennial tendencies. It is fairly similar in appearance to the wild forms of *D. purpurea*. The flowers are basically cream-colored, suffused with Strawberry-pink. Plants grow to a height of 2½ to 3 feet.

Source: 29

Doronicum

Doronicum, Leopardsbane Daisy Family (Compositae)

These plants are valued for their 2 to 3-inch bright yellow, Daisy-like flowers in May. Apart from the display they make in the garden, the flowers are excellent for cutting purposes.

Doronicums will tolerate a position either in full sun or partial shade, but the soil should be well supplied with humus for the root systems are quite shallow. The leaves begin to deteriorate, or disappear entirely, in midsummer so it is wise not to make large groupings. Although reputed to require division every two years, the plants may remain undisturbed for four years or more. Division, when indicated, usually is done in August or very early spring before new growth commences. Depending upon variety, Doronicums may be planted either at the front or middle of the border. Allow them to be close enough to plants with spreading foliage so that gaps will be filled in when the Doronicums disappear in summer.

D. caucasicum — Caucasian Leopardsbane — Flowers about 2 inches across, borne one to a stem. Stems about 12 to 15 inches

high when in flower. Leaves kidney-shaped, serrated at the edges. Plants of low, creeping habit.

Sources: 3,14,66,67,68; A,K

D. caucasicum* var. *magnificum — Flowers 2½ inches. Otherwise about the same as the preceding.

Sources: 24,39,66,69; I,J,L

***D. caucasicum* 'Madam Mason'** — Similar to *D. caucasicum* var. *magnificum* in flower, but the foliage tends to be somewhat more persistent in summer than that of the species.

Sources: 13,32,59,66,67,68; C

D. plantagineum — Showy Leopardsbane — Flowers up to 3 inches across on plants 3 to 5 feet. Very showy in flower, but considered coarse in overall appearance compared to the others. Source: 66

Several other species and cultivars of *Doronicum* are frequently described in books on perennials. None of them appears readily available from nurseries at the present time.

Echinacea purpurea

Purple or Hedgehog Coneflower Daisy Family (Compositae)

In general appearance this plant is very stiff and coarse and is best seen naturalized well away from the perennial garden or more formal plantings. It will vary in height from 3 to 5 feet and has large bristly leaves and purplish flowers with ray petals which droop in a rather unattractive manner.

There are several named varieties which invariably are listed as cultivars of *E. purpurea*. Undoubtedly they are hybrids derived from crossing *E. purpurea* with several other species; they frequently are found in catalogs under *Rudbeckia*. All are much more refined in appearance, bloom over long periods in dry soil, and reach heights of 3 to 4 feet. They are best in well-drained, sandy soils in either full sun or light shade. The stems are very sturdy and staking is not required. Division after the fourth year often will be necessary. About their only real drawback is that the flowers are prone to attack by Japanese beetles; therefore Purple Coneflowers probably should not be grown extensively where these insects are a problem and spraying cannot be done regularly.

Sources: 4,27,29,39,59,60; A,B,K,L



Echinacea purpurea — *Purple Coneflower*

E. × 'Bright Star' — Bright rose-red, 2½ to 3-inch, Daisy-like flowers with maroon-red centers; plants 2½ to 3 feet.

Sources: 24,67; I

E. × 'Robert Bloom' — Vigorous, freely branching plant, with 2½ to 3-inch carmine-purple flowers with orange centers. 2½ to 3 feet.

Sources: 66,67

Echinops ritro — *Steel Globe Thistle*

E. × 'The King' — 3-inch coral-crimson flowers with maroon or brownish centers. 3 feet.

Sources: 13,24,32,66,67,68; C,I

E. × 'White Lustre' — The only cultivar offered with white flowers. Blossoms heavily, even in times of drought, but the leaves are quite coarse and the petals are inclined to droop in an ungainly manner.

Sources: 13,24,32,66,67; C,I

Echinops

Globe Thistle Daisy Family (Compositae)

If one is unfamiliar with the appearance of Globe Thistles, it would be prudent to observe them growing in a garden setting before deciding whether or not to obtain some plants. Some people object to the rather coarse general appearance and the harshness of the Thistle-like leaves. Others, including those who like to arrange cut flowers, prize the blue globular flower-heads which are made up of many spiny bracts and flowers. These appear in midsummer to early fall, are excellent for cutting, and may be dried easily for winter arrangements. The leaves are white on the undersurface and give character to the plant. Whatever one's opinion, these are bold plants which seldom fail to attract comment.



Although Globe Thistles will tolerate partial shade, a position in full sun gives best results. The soil should be well drained and need not be unusually fertile. Plants will endure considerable exposure to dry conditions, but prefer soil of average moisture retention; wet, soggy conditions should be avoided, however.

Plants form dense clumps which never require staking. They are best seen arranged in a fairly bold group of about three at the middle or rear of the border. Division is not necessary for many years, but is an arduous chore because established clumps have very extensive root systems about a foot deep. New plants will sprout up from old roots left in the ground so replanting is seldom necessary.

E. 'Taplow Blue' — The best cultivar. Rich steel-blue flower heads with a silvery overcast, up to 3 inches in diameter. Plants bushy, 4 to 5 feet tall. Blooms in August.

Sources: 3,13,21,24,32,67,69; C,I,L

E. ritro — Steel Globe Thistle — Blue flowers, somewhat variable in color, on 3 to 5-foot plants.

Sources: 39,45,46,66,68; A,B,E,J,L

E. sphaerocephalus — Common Globe Thistle — Flowers silvery-gray; plants 5 to 6 feet tall.

Source: 45

Epimedium

Barrenwort, Bishop's Hat

Barberry Family (Berberidaceae)

This group is well known to a number of advanced gardeners, but has been neglected undeservedly by the majority of the gardening public in this country. Barrenworts' greatest value is as foliage plants. The delicate pinnate leaves are semi-evergreen in winter; new leaves in spring are pale green tinted with a delicate shade of rose, and often have pink veins. In summer they become a deep glossy green, mottled with purple in some varieties. The cooler weather of autumn brings out an attractive crimson coloration.

The old foliage should be cut back to the ground in late winter or very early spring to enhance the beauty of newly unfolding leaves and to show off the flowers. Although these are small (about ½-inch) they are as handsome as some orchids. They are cup-shaped with conspicuous long spurs, and are borne



Epimedium grandiflorum

on numerous stems 8 to 12 inches high. According to variety, colors may range from red to yellow, white, rose or lilac.

Barrenworts are most accommodating in their ease of culture. Although most frequently grown in light shade, they will thrive at the front of the border in full sun if the soil is fairly moist during the summer months. In a shady position they will tolerate considerably drier conditions, but very dry places should be avoided. One of the great unsung virtues of the plants is their ability to grow at the base of a tree, a situation which few other perennials will tolerate due to root competition. Many perennial gardens are planned around small trees such as crab apples or magnolias, and underplanting often poses a problem. *Epimedium* is frequently the best plant to use, treated as a ground cover.

These are very long-lived plants and division will usually be necessary only for purposes of propagation. This is best done in early spring or early fall. Barrenworts are best seen planted in small groupings of at least three, spaced about 10 inches

apart. The plants spread in a modest way, but never to the point of becoming invasive, so it would be wise to allow at least a foot of space around them to accommodate this tendency and prevent crowding by taller neighboring plants.

Unfortunately, in the case of this group, incorrect names abound in the nursery trade. Although many others are described in text books, the following appear to be all that are offered at the present time by dealers in perennials. A few not listed here might be found in the catalogs of nurseries specializing in rock garden and alpine plants.

E. grandiflorum* var. *album — Flowers white. Plants about 10 to 12 inches tall.

Source: 66

***E. grandiflorum* 'Rose Queen'** — Flowers bright rose, spurs tipped with white.

Sources: 29,66

E. pinnatum — Flowers bright yellow with very short brownish-purple spurs. Plants 8 to 12 inches tall. Plants obtained from nurseries under this name are often the variety *colchicum* which has fewer leaflets than the species.

Sources: 66,67

***E. pinnatum* 'Snow Queen'** — Flowers white. Plants 10 inches tall.

Source: 66

***E. × rubrum* (*E. alpinum* × *E. grandiflorum*)** — Large 1-inch bright crimson flowers, flushed yellow or white. The showiest variety in flower. New leaves red in spring. Sometimes listed under the name *E. alpinus* var. *roseum*.

Sources: 13,32,67,68; C

***E. × versicolor* 'Sulphureum' (*E. grandiflorum* × *E. pinnatum* var. *colchicum*)**, sometimes listed as *E. pinnatum* var. *sulphureum* or *E. sulphureum* — Flowers yellow. Leaves have a pinkish tinge in autumn.

Sources: 13,32,49,66,67,68,69; C

***E. × warleyense* (probably *E. alpinum* × *pinnatum* var. *colchicum*)** — Sepals coppery-red, petals yellow, spurs yellow streaked with red. Plants about 12 inches high and quite vigorous of growth.

Source: 68

Erigeron 'Pink Jewel'

E. × youngianum 'Niveum' (probably *E. diphyllum* × *E. grandiflorum*) — Sometimes listed as *E. macranthum* var. *niveum*. Flowers white. Plants about 9 to 10 inches and of compact habit.

Sources: 13,49,66,67,68,69; C

E. × youngianum 'Roseum' (sometimes listed as *E. macranthum* var. *lilacinum* or *E. lilacinum*) — Flowers clear purplish-mauve. Sources: 49,66,67, 68

E. 'White Flower Hybrid #1' — Flowers red and yellow. Source: 69

Erigeron

Fleabane

Daisy Family (Compositae)

Although quite similar in flower to the Fall Asters, this group blooms earlier (June and early July) and does not need frequent division if the soil is light and sandy with good drainage. Diversity of color and height are far more restricted than with the Asters, but most varieties can be left in place for four years before clumps begin to deteriorate.

They demand a position in full sun. Flowers are excellent for cutting; it is said that frequent removal of old blossoms will help to prolong the blooming season.

Fleabanes are more appreciated in Europe, particularly England, than they are here. The lower growing cultivars frequently have been used in rock gardens; when brought into the perennial border, they are best planted in groups of at least three to produce a strong effect. Fleabanes are good plants to try where soils are relatively dry and infertile, otherwise there are many showier plants which bloom at the same time.



E. aurantiacus — Orange Daisy or Fleabane — Semidouble, bright orange flowers up to 2 inches across in July and August on plants about 9 inches high. Perhaps the showiest of the group in flower, but may not be quite as hardy as some of the others.

Sources: 24; I

E. speciosus — Oregon Fleabane — Narrow, violet-blue petals, yellow centers. Plants 18 inches to 2 feet tall. Bloom in late June and July, then with sporadic flowers to September.

Sources: 69; J,K,L

E. 'Double Beauty' — Double violet-blue flowers with yellow centers. Plants 18 to 24 inches tall.

Sources: 13,24,32; C,I

E. 'Foerster's Liebling' (also listed as 'Foerster's Darling') — Flowers bright pink with yellow centers, semidouble. Plants 18 to 24 inches tall.

Sources: 13,24,49,67,69; C,I

E. 'Pink Jewel' — Flowers lavender-pink with yellow centers. Plants 18 to 24 inches tall.

Source: G

E. 'Prosperity' — Flowers mauve-blue, nearly double. Plants 18 inches tall.

Sources: 24,66; I

E. 'Red Beauty' — Flowers ruby-red with yellow centers. Plants 15 to 18 inches tall.

Sources: 28; K

E. compositus — Fernleaf Fleabane — Flowers white. Plants 4 to 6 inches tall. Blooms in early spring. More suited to the rock garden.

Source: 29

E. linearis — Narrow-Leaved Fleabane — Flowers yellow. Plants 8 inches tall. More suited to the rock garden.

Source: 29

Eryngium

Sea Holly, *Eryngo* Carrot Family (Umbelliferae)

Deserving of more frequent cultivation, these are ideal plants for sunny areas where the soil is sandy and remains dry, especially in winter.

Eryngium planum



Sea Hollies are Thistle-like in appearance, usually are planted as a single specimen or in twos; they do not lend themselves to massing. Although they give a bold effect, it is not a coarse one. They are very long-lived. The species recommended here develop deep fleshy roots, and resent disturbance of any sort. They range from 1½ to 3 feet in height, the wiry stems do not require staking, and there are no insect or disease problems. The rather unorthodox flowers make interesting subjects for arrangements, and if picked when fully open, retain their color when dried.

E. alpinum — Bluetop Eryngo — Perhaps the most beautiful of the group, it is the only one that will tolerate light shade and somewhat heavier soil conditions. The 2-inch flower heads are a beautiful silvery-blue. The uppermost leaves or bracts just below the flower heads are pointed or jagged and have this color also. The lower leaves are deeply heart-shaped and toothed. Plants grow to a height of 18 to 20 inches; the flowers appear in August and last through September.

Source: 29

E. amethystinum — Amethyst Sea Holly — Lower growing, not over 1½ to 2 feet in height. The flowers, bracts, and upper stems are steel-gray shading to amethyst in color. The leaves are deeply cut and spiny. Blooms in July and August.

Sources: 13,24,66,67,69; C,I

E. bourgati — Mediterranean Sea Holly — Flowers and long bracts steel-blue. Plants about 1½ feet in height. Blooms from June to August.

Source: 29

E. planum — Rounded, small blue flower heads on stems which branch more than the other species, thus are denser in growth. Plants grow to 3 feet in height and may require staking unless the soil is poor.

Source: E

E. 'Violetta' — Large violet-blue flowers. Plants about 2 to 2½ feet in height.

Sources: 24; I

Eupatorium coelestinum

**Mist Flower, Hardy Ageratum
Daisy Family (Compositae)**

Only one species in this genus is appropriate in the perennial border; all others are more suitable when naturalized in wild gardens or woodlands. *E. coelestinum* is native from New Jersey to Florida and Texas, and its blue or lavender flowers can be used in the same manner as Asters to provide a contrast to the yellow, orange, and bronze colors of many autumn flowering plants. It resembles *Ageratum* when in bloom and some people will mistake it for that plant even though it flowers in late summer and is taller, growing to a height of 2 feet.

The blossoms are excellent for cutting, and dry well if picked just before opening.

Mist Flower does best in full sun in an ordinary well-drained garden soil, and also will tolerate partially shaded conditions. Plants spread rapidly by underground stems and will require division after the second or third year to keep them in bounds and in good appearance. They appear late in the spring, so early cultivation should be done with care.

Sources: 24,39,59,66,69; B,G,I,K

E. coelestinum* var. *album — White-flowered form of the species.

Sources: 39; B

***E. coelestinum* 'Wayside Variety'** — A somewhat more compact form of the species with pale lavender flowers. Plants are 12 to 14 inches in height.

Sources: 13,32,67; C

Euphorbia

**Spurge
Spurge Family (Euphorbiaceae)**

Several members of this large and varied family of both temperate and tropical areas are of outstanding value in a low maintenance situation. They require full sun and a porous, somewhat sandy soil of ordinary fertility; if encouraged by anything more than a "lean diet" they may spread rapidly and lose their value. The varieties recommended here all are long-lived and dislike being transplanted. They appear to be immune to insect or disease problems. Flowers are relatively long lasting and make excellent subjects for arrangements if the cut ends of the stem are charred by a match and plunged into deep water. As with their well-known relatives, the Poinsettias, the true flowers appear in small clusters surrounded by the more showy petal-like leaves called bracts.

E. corollata — Flowering Spurge — An American species which grows to a height of about 2 feet and produces numerous flower clusters with small white bracts in July and August. It is similar in appearance to *Gypsophila* (Baby's Breath), in blossom, and when cut the flowers have the same use. Gives a refined, lacy effect in the garden. The leaves turn red in the fall. Sources: 24; I

E. epithymoides — Cushion Spurge — Almost always listed in nursery catalogs as *E. polychroma*, this is a neat, symmetrical, mound-like plant for the front of the border. It grows to a height of 1 to 1½ feet and produces globular umbels of bright chartreuse-yellow bracts from the end of April through May. The leaves turn red in the fall.

Sources: 13,14,24,32,57,59,66,67,68,69; A,C,I,K,L

E. myrsinites — Myrtle Euphorbia — Probably best as a rock garden plant, but of use at the front of a border if soil conditions are especially dry. This species produces stems about 1 to 1½ feet long which are never over a few inches high because they trail over the ground. The leaves are blue-green and remain on the plant through the winter. Flowers appear in clusters at the ends of the stems in late April and early May. The plant self-sows, but seldom freely enough to become a nuisance.

Sources: 32,66,67; L

Filipendula

Filipendula, Meadow Sweet, Dropwort Rose Family (Rosaceae)

Filipendulas are grown for their feathery terminal clusters of numerous small flowers. Some may be large plants 4 to 6 feet high and suitable only for the back of the border or in combination with shrubs; or in woodland or streamside plantings. The taller types require moist soils with a fairly high humus content, and some shade. These all are long-lived plants which do not require frequent division.

F. hexapetala — Dropwort — Seldom exceeds 2 feet in height and is the only Filipendula suited to the front of the border. Tolerates full sun and dry soil conditions. The finely divided fernlike foliage is especially pleasing and can be used to advantage to tone down the appearance of coarser plants. Creamy-white flower panicles are produced in June.

Sources: 32,68

***F. hexapetala* 'Flore-plena'** — Double Dropwort— A form with double white flowers. Smaller in stature, about 15 to 18 inches tall, and suited to the front of the border.

Sources: 4,32,66,67,68

***F. purpurea* 'Elegans'** — cultivar of Japanese Meadow Sweet — (sometimes listed as *F. palmata* var. *elegans*) — Grows to a height of 2 to 4 feet depending upon soil conditions. Flowers white with bright red stamens.

Sources: 32,66

E. rubra — Queen-of-the-Prairie — One of the best back-of-the-border plants. Grows from 4 to 6 feet tall and produces large terminal clusters of small pink flowers in June and July.

Sources: 32,66

F. rubra* var. *venusta — Martha Washington Plume — Fragrant, deep pink flowers in 12-inch clusters in July and early August. Considered far superior to the species but presently difficult to obtain.

Source: 66

F. ulmaria — Queen-of-the-Meadow — Another tall species which will reach 4 feet in height under good conditions. Fragrant white flowers from mid-June to mid-July. This is a Eurasian species which is now rather widely naturalized in parts of New England. It does not seem to be available at the present time, but the following cultivars can be recommended.

***F. ulmaria* 'Aurea Variegata'** — A rare form with leaves variegated with creamy-yellow.

Source: 32

***F. ulmaria* 'Flore-Plena'** — Double-flowered form of the preceding.

Sources: 32,66

Gaillardia

Blanket Flower

Daisy Family (Compositae)

Gaillardias can cause great disappointment unless they are grown in a very well-drained soil. Many types sprawl unless staked early, and the best ones are seldom very hardy. Some people are greatly attached to the bright colors of the Daisy-like flowers; others think them too gaudy. Many varieties have an extended period of blossom throughout the summer, but because

of their tendency to be only temporary residents of the garden, they cannot be recommended here.

G. aristata — Common Perennial Gaillardia — The principal parent of the modern cultivars. Native in the western U.S.A. Flowers basically yellow, but may have purple to red blotches at the base of the petals.

Source: 46

G. 'Baby Cole' — Probably the best of all the cultivars, and perhaps more permanent than most. The dwarfest; plants 6 inches high. Large red flowers, tipped with yellow.

Sources: 24,29,60; I,K

G. 'Burgundy' — Large wine-red flowers up to 3 inches across. 30-inch plants.

Sources: 3,13,25,30,39,49,68,69; A,B,C,E,K,L



G. 'Dazzler' — Bright, golden-yellow flowers with maroon centers. Plants 2 to 3 feet tall.

Sources: 3,25,58,68; B,E,J,K,L

G. 'Goblin' — Flowers deep red with yellow tips on the petals. Plants 1 foot tall.

Sources: 3,13,49,68,69; A,B,C,E,K

G. 'Portola' — A strain raised from seed. Flowers in various combinations of red and yellow. Plants about 30 inches tall.

Sources: 69; K

G. 'Sun Dance' — Dwarf, compact plants about 8 inches in height. Red centers and petals which have yellow tips.

Source: 67

G. 'Yellow Queen' — Buff or chamois-yellow flowers. Plants 2 feet tall.

Sources: 67; L

Geranium

Cranesbill

Geranium Family (Geraniaceae)

Sometimes confused with *Pelargonium* (whose common name is Geranium), this is a showy group of great value for summer bedding and as pot plants. True geraniums come from temperate parts of the world. A number of the handsome species are hardy as far north as Boston and among them are several which adapt well to low maintenance plantings.

They are low mound-like plants, seldom over a foot high and best for positions at the front of the perennial garden. The lower growing varieties are highly adaptable to rock garden conditions. Blooming is best in full sun, but results are nearly as good in partial shade. Flowers vary in size from an inch to nearly 2 inches and are produced fairly freely throughout most of the summer. Rampant growth is encouraged by an overly fertile soil. All species discussed here can be left undivided for a minimum of four years, often longer. When the clumps begin to deteriorate, division is best performed in the spring.

G. cinereum 'Ballerina' — Lilac-colored flowers with dark red veins and center. Plants 4 inches high.

Sources: 24; I

G. cinereum 'Splendens' — Screeching magenta flowers 1 inch across with dark blotches at the base of each petal. Flowers

Gaillardia aristata cultivar

freely all summer. Plants 3 to 4 inches.

Source: 69

G. dalmaticum — Light pink flowers with deeper veins; produced freely in May and June. Plants 4 inches.

Sources: 13,24,32,39,49,58,66,67,69; C,I,J,L

G. dalmaticum* var. *album — White-flowered form of the preceding species, very pale pink at the center.

Sources: 13,66,69; C

G. endressii — Much taller in stature, 15 to 18 inches, and can be used further back in the border. Flowers light rose with somewhat darker veins. Cut back after the first flowering in May for more flowers late in the summer. The two cultivars which follow are better color forms than the species.

Sources: 32,49

***G. endressii* 'Johnson's Blue'** — Good light blue. Flowers very heavily produced but may not last as long in bloom as the species. Plants 15 to 18 inches.

Sources: 67,68

***G. endressii* 'Wargrave Pink'** — Flowers clear pink, produced over most of the summer. Plants 15 to 18 inches.

Sources: 13,67; C

G. grandiflorum — See *G. meeboldii*

G. ibericum — Iberian Cranesbill — Violet-blue flowers with darker veins. Blossoms during June and July. Plants 2 feet in height when in flower.

Source: 67

G. meeboldii — Lilac Cranesbill — The recent change of name is, perhaps, unfortunate for a plant so firmly entrenched in garden circles as *G. grandiflorum*, (as it is listed in all catalogs.) Large 1½ to 2-inch magenta flowers with reddish veins; blooms May into July. 18 to 24 inches in height when in flower. Individual plants form clumps about a foot wide.

Sources: 3,24,32,67,69; I

G. meeboldii* var. *alpinum — Flowers 1½ inches across and close to true blue. Plants about 12 inches high with deeply lobed foliage.

Sources: 13; C,K

Geranium sanguineum var. *prostratum*



***G. meeboldii* 'Plenum'** — Double purple-blue flowers in May and June.

Sources: 13,49,66; C

G. sanguineum — Bloodred Geranium, Bloody Cranesbill — Forms large clumps 1½ to 2 feet in diameter. Fine in an ordinary situation, but excessive spreading is encouraged by overly rich soil conditions. Flowers purple-red from May to August. Deep red autumn foliage coloration. Plants about 12 inches high.

Sources: 4,32,66

G. sanguineum* var. *album — White-flowered form of the preceding species.

Sources: 3,32,68

G. sanguineum* var. *prostratum — Often listed in catalogs as *G. lancastriense* or *G. sanguineum* var. *lancastriense*. Much more compact in growth than the species and not as rampant. About 6 inches in height. Bright pink blossoms with reddish veins. Flowers most of the summer.

Sources: 1,3,13,24,32,59,66,68; C,I

Geum

Geum, Avens Rose Family (Rosaceae)

Geums have had a bad name among some gardeners in the Boston area. Many people have heard glowing reports of the wonderful flower colors but have been dismayed when their newly acquired plants died during the first winter.

G. coccineum, a species with bright orange-red flowers, is native to Asia Minor and Southern Europe. Breeders have selected hardy forms of this and crossed them with a somewhat less hardy species, *G. chiloense* (the Scarlet Avens from Chile), to produce a remarkably showy and valuable group of cultivars. These are relatively hardy in our area and do not require the biennial divisions necessary to maintain some of the older selections which are seldom available today. Despite this, Geums cannot be recommended for general use here, for not all gardeners will succeed with this group.

Geums prefer a spot in full sun and a well-drained soil which contains as much organic matter as possible for moisture retention in the summer. Soggy winter conditions are fatal. The plants are slow to increase in size, and may not produce a great show of either leaves or flowers until the second or third year. The cultivars discussed here will go for many years before division is necessary for purposes of rejuvenation.

Plants usually attain a height of 2½ to 3 feet. They are most

effective in groups of three planted 12 to 18 inches apart. Geums bloom freely from about mid-May to August, and intermittently thereafter if seed formation is prevented by removing the faded flowers.

G. × *borisii* (*G. bulgaricum* × *G. reptans*) — Best in rock gardens. Does not tolerate heat or dry conditions. Flowers bright orange-scarlet. Plants 8 inches in height.

Sources: 4,13,32,49,66; C

G. 'Fire Opal' — 2½ to 3-inch brilliant red flowers with bronze overtones.

Sources: 13,32,66; C

G. 'Golden Sunset' — Semidouble golden-orange flowers.

Source: 67

G. 'Lady Stradheden' — Semidouble golden-yellow flowers.

Sources: 24,60,66,69; A,B,I,J,K,L

G. 'Lamb's Spectacular' — Bright golden-yellow flowers. Plants 8 inches in height.

Source: 32

G. 'Mrs. Bradshaw' — Semidouble scarlet flowers.

Sources: 3,24,49,59,60,67,69; A,B,I,J,K,L

G. 'Princess Juliana' — Semidouble, bronzy-orange flowers.

Sources: 13,32,66; C

G. 'Red Wings' — Semidouble scarlet flowers.

Source: 32

G. 'Starker's Magnificent' — Double apricot-orange flowers.

Sources: 24,32,66; I

G. 'Wilton Ruby' — Glowing ruby-red flowers.

Sources: 13; C

Gypsophila

Baby's Breath, Chalk Plant Carnation Family (Caryophyllaceae)

The second common name and the generic name, derived from the Greek word which means lime-loving, give one of the main clues to success with this group. It is wise to have the soil tested before attempting to grow *Gypsophila*; if the reaction is lower than pH6, ground limestone should be applied to bring it up to pH7 or pH7.5. One other condition is equally as necessary if success is to be achieved: *Gypsophila* will not overwinter in moist soggy soils and a well-drained sunny situation is essential. Care should be taken in choosing a good location because all except the dwarf cultivars of Baby's Breath take up

a lot of room. Once established, they should not be moved as the thick fleshy roots resent disturbance.

These may seem rather exacting requirements for a plant that is included in a list of maintenance-free garden subjects. These requisites are, however, relatively simple if properly understood; and once established *Gypsophila* can be expected to grow for years with little further attention if it receives the necessary dose of ground limestone from time to time. A position in full sun is desirable, but light shade during part of the day is also acceptable. In our area it is wise to protect the plants with a winter mulch. This, however, should not cover the crown lest rotting occur before the ground becomes completely frozen.

***G. paniculata* — Baby's Breath** — Single, white-flowered form. Plants grow to a height of 3 feet or more with a similar spread. In July masses of flowers are produced in large panicles. These are excellent for cutting and, if picked when fully open, are easily dried by placing the stems upside-down in a shady, well-ventilated place. This applies to cultivars of *G. paniculata* as well. Plants take at least two years to become established; spring planting is favored so they will have the benefit of an entire growing season before winter arrives.

Sources: 3,25,46; E,J,K

***G. paniculata* 'Bristol Fairy'** — The most popular, and perhaps the best cultivar. The double white flowers are freely produced in July and again in August to October if the old flowers are removed. It is a large plant; established specimens often will cover an area 4 feet wide. This and the other cultivars are grafted onto roots of *G. paniculata*, and it is advisable that the graft union be set at least 1 inch below the soil line. This will encourage roots from the stems and possibly help to keep them from flopping. Even so, the taller varieties often require staking as soon as the growth starts to appear. (See section on staking.)

Sources: 3,13,23,24,25,28,32,37,44,58,59,60,67,68,69; B,C,G,I, J,K,L

***G. paniculata* 'Compacta'** — A smaller form with single white flowers. Plants 2 to 3 feet in height with a similar width.

Sources: 37,67

***G. paniculata* 'Compacta Plena'** — Double white-flowered form of the preceding.

Sources: 13; C,H,L



Gypsophila paniculata 'Bristol Fairy' planted too close to a clump of Day-lilies.

G. paniculata 'Perfecta' — Double white flowers up to twice the size of those of *G. 'Bristol Fairy'*. Plants of compact habit, about 3 to 4 feet in height and up to 3 feet wide.

Sources: 3,7,24,32,67,69; I

G. repens — Creeping Baby's Breath — Trailing, nearly prostrate plants with 12 to 18-inch stems bearing masses of white flowers in early summer. Cultivars of this species are hardier than those of *G. paniculata*. Suited to the front of the border, but have many other uses in rock gardens or on dry walls.

Sources: 3,69; B,J,K

G. repens 'Rosea' — Rosy pink flowers. Plants about 6 inches.

Sources: 3,4,13,24,29,59,68,69; A,B,C,E,I,J,L

G. repens 'Rosy Veil' (syn. 'Rosenschlier') — Delicate, double, soft pink to white clusters of flowers on interwoven stems; blooms June to August. Grows in an erect manner to a height of 18 inches. Due to the tangled stems, it is not good for cut flowers, but in all other respects is a fine border plant. Although commonly classed as a cultivar of *G. repens*, it may be a hybrid.
Sources: 3,24,32,59; H,I

G. × 'Bodgeri' (*G. repens* 'Rosea' × *G. paniculata*) — Similar in overall appearance to cultivars of *G. paniculata* but considerably more compact. Semidouble white flowers, often with a pinkish tinge, in late May through June. Thoroughly hardy. Excellent for cut flowers.
Sources: 24,32,68; I

G. 'Pink Fairy' — Usually offered as a cultivar of *G. paniculata*. Double pink flowers which are produced for most of the summer. Plants 18 inches to 2 feet in height.
Sources: 7,13,24,37,44,58,60,69; B,C,G,I,J,K,L

G. 'Pink Star' — Usually offered as a cultivar of *G. paniculata*. Double pink flowers. Plants about 18 inches in height.
Sources: 25,28,32,67,68

G. oldhamiana — Pale pink flowers in dense clusters in August and September. Plants about 3 feet in height. Not superior to any of the above, and inclined to flop.
Sources: 4,46

G. 'Flamingo' — Double-flowered form which perhaps belongs to the above species. Flowers pink with tints of mauve.
Sources: 13,24,59; C,I

Helenium

Sneezeweed, Helen's Flower Daisy Family (Compositae)

Cultivars of our native *H. autumnale* have long been considered valuable for fall color in the border. Some cultivars grow from 4 to 6 feet tall and must be divided, if not every other year, then every third year, to maintain any semblance whatever of tidiness. The few available cultivars under 2½ feet may go for longer periods, and do not require staking as the taller ones do. For this reason they are useful in the low maintenance garden as a partial substitute for Chrysanthemums. They blossom throughout most of the late summer and autumn, with numerous small, Daisy-like flowers in shades ranging through yellow and red to bronze.



Helenium 'Butterpat' with underplanting of hardy Chrysanthemums.

A position in full sun is necessary. Plants perform poorly in dry soils; those of moderate fertility and high organic matter content will produce the best results. Sneezeweeds are remarkably tolerant of wet soil conditions during the growing season. Division to rejuvenate the plants should be done after the fourth year. The cultivars recommended here are best seen in groups of three planted 18 to 20 inches apart at the front or middle of the border.

***H. autumnale* 'Brilliant'** — The tallest variety recommended. About 3 feet in height with strong stems.
Source: 69

***H. autumnale* 'Moerheim Beauty'** — Deep bronze-red flowers in July and August. Plants 2½ feet in height.
Sources: 13; C

H. hoopsei — Orange Sneezeweed — Unlike the cultivars of *H. autumnale*, this species blooms in May and June with large orange flowers. It will tolerate light shade. Plants 2 feet in height.
Sources: E,L

***H. autumnale* 'Pumilum Magnificum'** — Deep yellow flowers from late July through September on plants 12 to 18 inches tall.
Sources: 32,67

H. autumnale — 4 to 6 feet under garden conditions. Flowers yellow.

Sources: 14,39

***H.* 'Bruno'** — Flowers deep mahogany-red in August and September. Plants up to 4 feet high.

Sources: 25,66,67; K

***H.* 'Butterpat'** — Flowers yellow. Plants 3 to 4 feet in height.

Sources: 13,25,66,67,68,69; C,K

***H.* 'Chippersfield Orange'** — Flowers copper to gold with markings of crimson. Plants 4 feet in height.

Source: 67

Heliopsis

Heliopsis, Hardy Zinnia, Orange Sunflower Daisy Family (Compositae)

At the middle or rear of the border, these plants are of value for their bright color and long blooming season. Semidouble or double bright yellow to orange flowers which are up to 3 to 4 inches across appear in midsummer and fall and are excellent

for cutting. Plants are usually 3 feet in height, with strong stems which do not topple.

About the only requirements are a position in full sun and soil that is moderately rich and does not dry out during the summer months. During periods of drought, frequent irrigation is advisable. If one's soil conditions are poor and dry, it probably would be better to avoid this group.

H. 'Golden Plume' ('Goldgefieder') — Bright yellow, nearly 3-inch flowers which are almost fully double; the centers are greenish. June to September. Plants 3 to 3½ feet in height. Sources: 24; I

H. 'Gold Greenheart' — Completely double bright yellow flowers with emerald-green centers. As the flowers age, the green disappears. Plants 3 feet in height. Sources: 13,68,69; C

H. 'Hohlspiegel' — 4-inch golden-yellow, semidouble flowers. July to September. Plants 3 feet in height. Source: 69

H. scabra 'Incomparabilis' — Deep yellow semidouble flowers with dark centers and overlapping petals. Plants 3 feet in height. Sources: 32,60,66,67,69; L

H. 'Karat' — Single deep yellow flowers. Plants 4 feet in height. Source: 69

H. 'Summer Sun' — Double golden yellow flowers. Plants 3 feet in height. Sources: 13,24,67; A,C,I,K

Helleborous

Hellebore

Buttercup Family (Ranunculaceae)

Depending upon weather conditions and species selected, this is a small group of perennial plants which will bloom anytime from about mid-November to May. The Christmas Rose, *H. niger* has a time span between November and April in periods when the ground is free of snow. The Lenten Rose, *H. orientalis* and its cultivars are later, from about early March to May. The exact timing depends upon weather and may vary from year to year.

The use of the word "Rose" in the common names may be misleading. These are not shrubs, but true herbaceous perennials about 15 inches in height with lustrous, leathery, dark evergreen leaves. The flowers are borne several to a stem and vary between 2 and 5 inches in diameter. The five large petal-like sepals surround a conspicuous center of yellow stamens.

These are plants which should be seen at close range to be fully appreciated; moreover, because of the time of the year in which they flower, a location close to a walk, patio, or a prominent part of the perennial or shrub border should be chosen. An area where the plants will receive partial shade in the summer and some sun in winter is best. The soil should be well drained, but not dry; this usually will necessitate the addition of organic matter. Highly acid soils are unsatisfactory and should be limed to bring the pH to around 6.5 or 7. Hellebores will benefit from the addition of about a handful of ground limestone around each plant every third or fourth year.

If the above conditions can be provided, culture is simple, and the plants will be very long-lived. They resent disturbance and take several years to form sizeable clumps. Spring is the best time for planting and the crown should be covered with about an inch of soil. A mulch is recommended to keep the plants evenly moist during the summer months, and irrigation will be necessary in times of drought. The life of the flowers can be prolonged by covering the plants with a small frame of plastic which is open at the base or ends to allow free circulation of air. This will help to keep ice and snow from the blossoms and prevent mud from being splashed onto them. The flowers are excellent for cutting and most valuable considering the time when they are in bloom. Char the base of the stems with a flame immediately after cutting.

H. niger — Christmas Rose, Black Hellebore — The Latin name and the second common name refer to the black roots, not the flowers. The latter are white, faintly flushed with pink as they age, and borne one to three per stem. They may vary between 2 and 4 inches in diameter. The leaf margins have sparse, coarse teeth.

Sources: 13,23,24,32,59,66,67,68,69; C,I,L

H. niger* var. *altifolius — A very desirable variety. The flowers are larger, up to 5 inches across, on stems an inch or 2 taller than those of the species.

Sources: 30,32,60

H. orientalis — Lenten Rose — A very variable species. Flowers are 2 to 3 inches in diameter and come in shades from white to chocolate-brown, purple, and rarely green. The leaves are a paler green and the margins bear numerous small serrated teeth.

Sources: 59,66

H. orientalis 'Atrorubens' — The petals are chocolate-purple on the inside, and greenish and purple on the outside. Said to be easier to transplant than other varieties.

Sources: 13,24,67; C,I

H. orientalis 'Millet Hybrids' — A group having 2 to 3-inch flowers in colors ranging from pure white, to pink, red, and chocolate. Some are speckled and striped.

Source: 32

Hemerocallis

Daylily

Lily Family (Liliaceae)

Hybridizers have produced so many cultivars of this nearly-perfect plant for the low maintenance garden that the greatest problem is knowing which varieties to choose. In general, the plants are nearly indestructible if placed in a reasonably fertile soil in sun or partial shade; excessive fertility will lead to rank growth and poor flowering. Soils which are fairly well supplied with organic matter and do not remain soggy for long periods will produce best results. Planting is best done in the spring at distances of about 2 feet to allow for expansion of the clumps. Although Daylilies have the reputation of being able to remain nearly forever without being divided, the most vigorous, heavy-flowering clumps are obtained when the plants are divided at intervals of four to six years. About the only other work is the removal of the flower stems once the blossoms have faded. These present rather an ugly appearance if left to dry on the plants.

Daylilies now can be obtained in almost any color of the rainbow; some varieties often combine two or more colors or hues. Flowers range in size from 3 to 8 inches across and may have a single ring of petals, or a double row of overlapping petals. When plants are in bloom, heights may range from about 20 inches to 4 or 5 feet according to variety. With careful selection it is now possible to obtain a flowering span from May to October.



Above: Hemerocallis — An unnamed hybrid seedling growing in a suburban Boston garden.

Right: Hemerocallis 'First Choice'

Much attention is presently given by *Hemerocallis* fanciers to a relatively new group called the tetraploids. These are varieties whose chromosome numbers have been doubled and, in general, are more robust and have larger flowers than the standard or diploid varieties. At present, the former fall into the category of "collectors items" due to their relative scarcity and very high prices (\$100.00 and frequently much more is not an uncommon price for a newly-introduced tetraploid cultivar.) Ordinary gardeners will want to select from the more reasonably priced diploids.

Many hundreds of varieties are listed by nurseries, and there are many nurseries which specialize in *Hemerocallis* exclusively. It would be very difficult to choose the best moderately priced varieties to grow today if it were not for the Popularity Poll published in the December issue of the *Hemerocallis Journal*. Daylily fanciers throughout the country have sent in lists of what they consider the best cultivars.



The following eight cultivars received the largest number of votes in the New England Region in December 1973. These are listed in order of popularity:

H. 'Mary Todd' — Large 6-inch, ruffled, golden-yellow flowers with very wide petals. 24 to 26 inches in height. Tetraploid.
Sources: 35,54,66

H. 'Winning Ways' — 6 to 8-inch greenish-yellow flowers with green throats. Wide, overlapping petals. 32 to 34 inches in height. Diploid.
Sources: 54,56,66; M

H. 'Catherine Woodberry' — Delicate 6-inch, light orchid flowers with green throats. 30 inches in height. Diploid.
Sources: 56,66

H. 'Hortensia' — 5-inch medium yellow, waxy flowers with ruffled, crimped borders. Greenish-yellow throats. 34 inches in height. Diploid.
Sources: 40,66; M

H. 'Cherry Cheeks' — 6-inch pinkish-red flowers with small yellow throats. Quite velvety in texture. 28 to 30 inches in height. Tetraploid.
Sources: 56,66

H. 'Heavenly Harp' — Polychrome type of flower, basically creamy-yellow overlaid with gold, and with bright pink ribs and a flush of intense rose-pink at the tips of the petals. Very ruffled. 28 to 32 inches in height. Tetraploid.
Sources: 35,40,56,66; M

H. 'Ice Carnival' — Icy and crisp, near-white, 6-inch flowers with small green throats. 28 inches in height. Diploid.
Sources: 54,66; M

H. 'Little Wart' — Attractive deep lavender-purple, 3½-inch flowers with green throats. 18 to 24 inches in height. Diploid.
Sources: 35,54,61

Other cultivars well suited to our area, which ranked high in the national polls are as follows:

H. 'Little Rainbow' — Polychrome blend of colors. Basically creamy-yellow overlaid with hues of bright pink. 26 inches in height. Diploid.
Sources: 40,54,56,66

H. 'Renee' — Clear, pale yellow, 3½-inch flowers which are nearly circular in form. Small green throats. 28 inches in height. Diploid.

Sources: 40,55; M

H. 'Perennial Pleasure' — Bright yellow, 6-inch ruffled flowers. Fragrant and remain open into the evening. 26 inches in height. Diploid.

Sources: 54,66

H. 'Lavender Flight' — 6¼-inch deep lavender flowers with ruffled, wide petals, yellowish-green throats. Hold color well in hot sun. 34 inches in height. Diploid.

Sources: 35; M

H. 'Sail On' — Bright red flowers of very firm substance. 30 to 34 inches in height. Diploid.

Source: 66

Heuchera

Coral Bells, Alum Root Saxifrage Family (Saxifragaceae)

These are excellent plants with few troubles, and capable of being left in place at least five years or longer before division will perform well in light shade. Soil should be well drained both in summer and winter, but should have sufficient humus so that it does not dry out quickly in the summer. Despite their long, fleshy roots, plants are very subject to being heaved out of the ground during periods of alternate freezing and thawing in late winter. To help alleviate this, the crowns should be set an inch below the soil level and mulching is advisable. Because of the heaving tendency, spring planting is preferred so that as large a root system as possible will be produced before winter. Divide only when the clumps become old and woody and flower production is scanty.

Heucheras produce numerous dainty, pendent, bell-shaped flowers on stems 15 inches to 2½ feet. Colors range from white to pink and vivid deep red. The blossoming period in June and July can be prolonged somewhat by removing the faded flower stalks and watering during dry periods. Flowers are excellent for cutting. The leaves are evergreen, and in some cultivars they are marbled with patches of bronze.

The modern cultivars are mainly derived from crossing *H. sanguinea* and some of its cultivars with *H. micrantha*. Al-

though several of the species are offered in catalogs, all the cultivars are superior in flower. Approximately 30 named cultivars are being offered in this country at the present time; the following is but a selection:

H. 'Bressingham Hybrids' — A strain of mixed colors in shades from white to pink to coral-red in May. Flowers stems 2 feet in height.

Sources: 24,32,67; A,B,I

H. 'Brizoides' — Small, soft pink flowers on stems 20 to 24 inches in height.

Sources: 13; C,J,L

H. 'Chartreuse' — Flowers soft chartreuse, an unusual color in this group. Stems about 20 inches in height.

Source: 67

H. 'Chatterbox' — Deep rose-pink flowers. Stems 18 inches in height.

Sources: 24,49,66; I,J,K

H. 'Fire Sprite' — Large rose-red flowers.

Source: 67



H. 'Freedom' — Rose-pink flowers. Stems 18 inches in height.
Sources: 32,67,68

H. 'June Bride' — Large pure white flowers on 15-inch stems.
Source: 67

H. 'Peachblow' — Pink flowers tipped with white.
Source: 32

H. 'Pluie de Feu' — Cherry-red flowers on stems about 18 inches high.
Sources: 3,24,68,69; I,L

H. 'Rosamundi' — Probably the best coral-pink variety for those who wish Coral Bells. Stems 15 to 18 inches in height.
Sources: 3,13,23,24,66,67; C,I

H. 'Scarlet Sentinel' — Large scarlet-red flowers on strong 24 to 30-inch stems. Very showy in flower.
Sources: 29,32,66

H. 'Snowflakes' — Large white flowers.
Sources: 3,32

H. 'Splendens' — Bright scarlet-red flowers on 28-inch stems.
Sources: 4,24,68; A,I

H. 'White Cloud' — Flowers white to cream in color on 18-inch stems.
Sources: 13,24,49,69; C,I,J,L

Hibiscus

Hardy Hibiscus, Rose Mallow Hibiscus Family (Malvaceae)

The numerous cultivars which have arisen from the selection and crossing of *H. moscheutos* and *H. palustris* are not frequently seen in the Boston area even though most of them are perfectly hardy. This is strange because the equally showy, tropical representatives of this genus, so frequently associated with Florida or Hawaii, are featured in many amateur greenhouses.

Some of the new cultivars display gigantic flowers up to 10 and 12 inches across, making them the largest flowered herbaceous perennials that can be grown in this area. Some people object to the size and bright colors as being too gaudy; but when plants are grown as single specimens in the mixed border, striking effects can be achieved. The largest flowers are produced

Foliage of Heuchera sanguinea

at the beginning of the blooming season in midsummer. By fall the flowers are usually smaller by about 2 inches.

Hardy Hibiscus are of very easy culture. They are the perfect answer to locations that are too moist for most other herbaceous perennials to survive; conversely, they will grow perfectly well in an ordinary well-drained garden soil. In moist areas heights may range from 5 to 8 feet, but in drier soils 3 to 5 feet is about average, depending on cultivar. Full sun is preferred. These are quite long-lived plants that resent disturbance. About their only fault is that the flowers are attractive to Japanese Beetles. It is fortunate that the blossoming period of most of the varieties extends well after the worst of the beetle population is gone. In wet areas self-seeding may occur freely, and if the named varieties are to be perpetuated, it would be best to remove all seedlings.



Hibiscus 'White Beauty'



Hibiscus 'Appleblossom' attacked by Japanese Beetles.

Some nurseries list a selection of unnamed varieties under such names as Mallow Marvels Mixed or Giant Mix. The following sources are for named varieties only:

H. 'Albino' — Flowers pure white.

Source: 37

H. 'Appleblossom' — Flowers light pink margined with deeper rose-pink. Crinkly petals.

Sources: 2,66

H. 'Brilliant' — Flowers bright red.

Source: 37

H. 'Cotton Candy' — Flowers soft pink.

Source: 67

H. 'Crimson Wonder' — Flowers rich red.

Sources: 60,66,67; M

H. 'Intense Pink' — Flowers rose-pink, brighter pink veins.

Sources: 67; M

H. 'Pink Giant' — Flowers large pale pink with a small red throat.

Source: 67

H. 'Pink Princess' — Flowers clear pink.

Source: 37

H. 'Raspberry Rose' — Flowers deep rose-pink with a bright red throat.

Source: 2

H. 'Ruby Dot' — Flowers white with a ruby-red throat.

Sources: 60,67

H. 'Ruffled White' — Smaller than usual. White flowers with a crimson throat. Petals crinkly at the edges.

Source: 2

H. 'Satan' — Large brilliant fire engine-red flowers.

Sources: 2,23,66,67

H. 'Snow White' — Flowers pure white with a cream throat.

Sources: 23,67

H. 'Strawberry Blonde' — Flowers bright deep pink, not as large as some of the others.

Source: 67

H. 'Super Clown' — Very large creamy-white flowers shaded rose-pink.

Sources: 2; M

H. 'Super Red' — Medium size dark red flowers.

Source: 2

H. 'Super Rose' — Flowers rose-pink.

Sources: 23,48,60; M

Hosta

Plantain-lily, Hosta, Funkia

Lily Family (Liliaceae)

If given a proper location as regards both soil and light, this group can rank high amongst those to delight the gardener who cannot spend a lot of time pampering his plants. A moderately rich soil with partial shade (preferably the shade of high trees) is about all that Hostas require to develop into majestic, eye-catching specimens. They will survive in almost any



Hosta Collection of the Arnold Arboretum at the Case Estates in Weston, Mass. Photo: P. Bruns.

type of soil, but are best in one well-supplied with organic matter. Wet soil conditions should be avoided.

A visit to the *Hosta* collection at the Case Estates of the Arnold Arboretum can be a rewarding experience for most visitors are unaware of the exciting range of variations in the group. This special planting is one of the most extensive collections of *Hostas* in this part of the country.

The most demanding seasonal task with *Hostas* is the removal of the flower stems once the blooming period has finished. They not only are unattractive when they dry out, but should not be allowed to go to seed; most named varieties do not reproduce true to type and the resulting seedlings can be a distinct nuisance. Nonetheless some of the best cultivars on the market today have arisen as chance seedlings in just this way.

There is little doubt that most *Hosta* cultivars are seen to best advantage if planted singly as specimen plants rather than being massed. In this way the handsome radial symmetry of the individual plants can be appreciated. Some of the more vigorous varieties will eventually occupy up to 3 to 4 feet of space in the garden and this must be taken into account at planting time. Some types make excellent ground covers, but the symmetrical effect is sacrificed. *H. undulata* with its white and green wavy leaves has been used extensively for this purpose, perhaps overly so, and is often seen growing in the full sun — a condition not tolerated well by most other species.

The taxonomy of *Hosta* is confused, and synonyms and incorrect names abound in the trade. The following is a selection of the many varieties offered. It should be noted here that they fall into two different groups: some grown for the interesting leaves only, and others for their flowers as well. If the latter are of primary interest, choices from this list will provide a period of blossom from late June into September.

H. albomarginata (syn. *H. lancifolia* var. *albo-marginata*) — White Rim Plantain-lily — This is a rather small plant. Clumps spread to about 2 feet. Leaves lance-shaped, with very narrow, pure white borders sometimes marked by short stripes running toward the center. Flowers are pale lilac on stems about 2 feet in height. Blooms in August.

Sources: 7,20,21,24,32,51,67,68; B,I,J

H. decorata (syn. *H. 'Thomas Hogg'*) — Blunt Plantain-lily — Similar to *H. albomarginata* in size and leaf coloration. Leaves are oval with blunt tips, about 6 inches long, with a prominent

silvery margin. Flowers are dark lilac on 2-foot stems; August blooming. Plants form 2-foot mounds.

Sources: 3,7,13,21,32,46,49,51,58,61,66,67; C

H. fortunei — Fortune's Plantain-lily — Leaves are 5 to 8 inches long, pale green and quite glaucous. Flowers are white to lavender, almost 1½ inches long, on 3-foot stems in August.

Sources: 7,21,24,51,66,67,69; J

H. fortunei* var. *gigantea — A very large form of the preceding species with leaves up to 12 inches. Mature clumps may reach up to 5 feet in diameter and are just the thing for a really bold accent.

Sources: 51,61,66

***H. fortunei* 'Marginata-alba'** — Irregular shiny white bands around the leaf edges.

Sources: 7,61

***H. fortunei* 'Marginata-aurea'** — Yellow borders on the leaves.

Sources: 24,61; I

Overleaf top left: Hosta plantaginea

Bottom left: Hosta sieboldiana 'Frances Williams'

Top right: Hosta sieboldiana

Bottom right: An effective grouping of Hostas illustrating their diversity of texture, leaf form, and flower.





H. lancifolia — Narrow-leaved or Japanese Plantain-lily — 6-inch-long lance-shaped leaves forming dense clumps about 2 feet across. Pale lilac flowers on 2-foot stems in August.

Sources: 13,21,24,49,51,61,68,69; B,C,I,J,L

H. plantaginea (syn. *H. subcordata*, *H. grandiflora*) — Fragrant Plantain-lily — Grown especially for the flowers which are white and trumpet-like up to 4 inches long. These appear in late August and September on 2-foot stems and are very fragrant. Clumps grow to a width of 3 feet. Shiny, rounded, pale green leaves.

Sources: 7,13,21,23,32,46,51,61,66,67,68; C,L

H. sieboldiana (syn. *H. glauca*) — Blue-leaved or Siebold Plantain-lily — The species and its cultivars are grown for the remarkably large, heavy-textured leaves, often crinkled somewhat like seersucker. The leaves are gray-green with a bluish cast; usually up to 12 inches in length. The flowers are white, appear in July and are usually pretty much hidden amongst the foliage. Plants develop into clumps about a yard in width.

Sources: 3,4,7,13,21,32,49,51,59,61,66,67,68; C,J,L

H. sieboldiana 'Frances Williams' (syn. *H. sieboldiana* 'Yellow Edge' or *H. sieboldiana aureo-marginata*) — One of the most desirable of all cultivars. The rounded glaucous leaves are bordered in shades of cream and yellow.

Sources: 7,21,32,51,61,66

H. tardiflora (syn. *H. lancifolia* var. *tardiflora*) — Autumn Plantain-lily — Of interest for its very late deep lavender-purple flowers in October. The plants are quite diminutive for the group, only 12 inches wide at maximum with a similar height.

Sources: 7,32,61,66

H. undulata (syn. *H. media picta*, *H. variegata*) — Wavyleaf Plantain-lily — The leaves have wavy margins and are variegated white on green. The flowers appear in July on 3-inch stems and are pale lavender. Plants are about 20 inches in width. This is the species that is perhaps the most familiar, having been used extensively as an edging plant for borders and walks. Withstands conditions in full sun better than the others.

Sources: 3,7,12,13,20,23,24,28,30,32,46,51,59,61,66,67,68; A,B,C,I,L

H. undulata* var. *univittata (syn. *H. univittata*) — The large green, waxy leaves have a central white stripe. The flowers are clear lavender and appear in July.

Sources: 7,21,51,61,66

H. ventricosa (syn. *H. coerulea*) — Blue Plantain-lily — The large, shiny, deep green leaves are twisted at the tips. The large flowers appear on 3-foot stems in July and August and are near-blue with a purplish tinge. Clumps reach a width of about 2 feet.

Sources: 4,7,13,21,51,57,61,66,67,69; B,C,H

H. 'Betsy King' — Grown mainly for its rich purple flowers on 20-inch stems in August.

Sources: 51,61

H. 'Honeybells' (*H. lancifolia* × *H. plantaginea*) — Very fragrant medium-sized lilac-lavender flowers striped blue on 3-foot stems in August.

Sources: 3,7,13,20,21,24,28,32,49,51,61,68,69; B,C,F,G,I,J,L

H. 'Royal Standard' — Very sweetly scented white flowers on 2-foot stems in August and September.

Sources: 24,59,61,61; I

Iberis

Candytuft

Mustard Family (Cruciferae)

Evergreen mounds of shiny foliage up to 2 feet wide covered with masses of white flowers in May characterize this valuable group for the low maintenance border. Cutting back the old stems at least halfway after the flowers have gone by is about the only work necessary. This will promote vigorous new growth and prevent the clumps from becoming woody and open-centered. A light, well-drained soil is necessary. Wet soil conditions in the winter lessen the hardiness of most varieties. In open winters without much snow, a light covering of evergreen boughs will prevent the foliage from burning. Aside from these few simple requirements, Candytufts present few other demands and will thrive for many years. In the perennial garden they should be planted in groups of at least three spaced about 15 inches apart so the clumps will grow together at their edges.

I. sempervirens — Evergreen Candytuft — The most common species offered, and the most reliable in the Northeast. Numerous pure white clusters of flowers are borne on 8-inch stems in May. Older plants will form mounds 6 to 9 inches high and as much as 2 feet in diameter.

Sources: 3,13,14,23,24,25,39,46,66,67,68; A,C,E,I,J,K,L

***I. sempervirens* 'Autumn Snow'** — Blooms again in September. Fairly compact habit of growth.

Sources: 13,28,44,65,66,67,68; C

***I. sempervirens* 'Little Gem'** — Compact plants only 6 inches high and 8 inches in diameter with small leaves and small clusters of flowers.

Sources: 3,13,24,66,68; C,I

***I. sempervirens* 'Purity'** — Quite compact habit of growth, but somewhat larger than the preceding cultivar. Very free blooming, flowers pure white.

Sources: 3,13,24,67,68,69; C,I,J,L

***I. sempervirens* 'Snowflake'** — Forms mounds 8 to 10 inches high with heavy foliage and large white flowers.

Sources: 13,24,32,59,66,68; C,I

***I. sempervirens* 'Snowmantle'** — Forms mounds about 8 inches high and is of quite compact growth.

Sources: 13,28,66; C,G,J,K,L

I. gibraltarica — Gibraltar Candytuft — Not fully hardy in our area. Plants of a rather scraggly habit, but with handsome lilac to light purple flowers which are produced into July.

Source: 49

I. tenoreana — Tenore Candytuft — Not fully hardy in our area, growth too unpredictable.

Source: 32

Iris

Iris, Fleur-de-lis Iris Family (Iridaceae)

There are so many varieties of Iris from which to choose that one hardly knows where to begin. The Tall, Intermediate, and Dwarf groups of Bearded Irises, which are the most popular groups grown, are the most demanding. The Siberian Irises, especially, and to a lesser extent the Japanese Irises, are not so demanding. Each group is discussed separately in order of their desirability for the low maintenance garden.

I. sibirica — Siberian Iris — The easiest type of Iris to grow in our area; forms large clumps up to 3 feet tall, with slender leaves, and 3-inch flowers in shades from white through blue and deep blue, purple, reddish-purple and violet. The blooming season is from mid-June to early July, just after the Bearded Irises and before the Japanese Irises. This species is fairly undemanding as to soil conditions, and although the plants will tolerate a somewhat poor dry soil, performance always will be best on rich, moist, slightly acid soils. They are best in full sun, but will tolerate partial shade as well. Very little attention is necessary. After a number of years the clumps will have started to die out at the center and division must be resorted to. It is fortunate that this is an infrequent task, as the large clumps are deeply rooted and become so tightly matted together at the base that the lifting and dividing process can be quite arduous. Planting and division are best done in the spring.

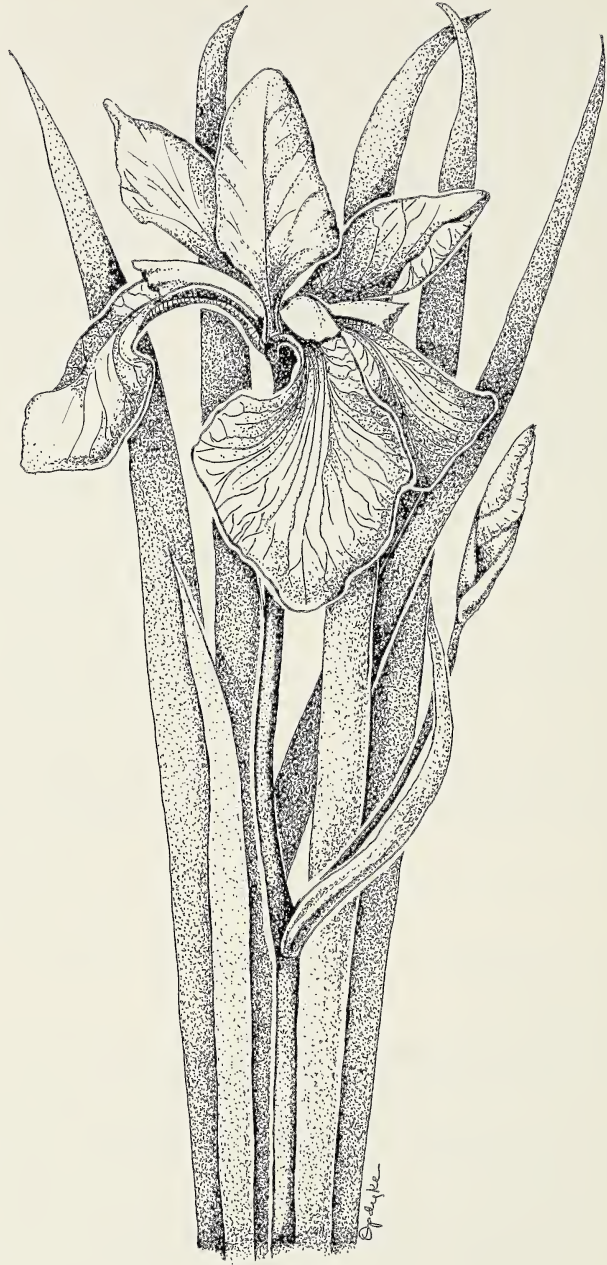
Siberian Irises present a far different picture in the garden than the more familiar Bearded Irises do. The foliage is more refined and the sizeable clumps have an upright vase-shaped habit of growth. When used singly scattered here and there from the front to middle of the border, they provide excellent bold contrasts. Although the range of flower colors and the length of the flowering season are considerably more limited than those of Bearded Irises, the foliage effect alone makes Siberian Iris worthy of consideration in any garden. When blossoming has finished, the numerous flower stalks bear attractive 2 to 3-inch seed pods. These dry out and turn brown later in the season, and are very handsome if left on the plants through the winter. They also are attractive in winter arrangements.

***I. sibirica* ‘Cambridge’** — Large turquoise-blue flowers.
Sources: 48,52,69

***I. sibirica* ‘Caesar’s Brother’** — Deep pansy-purple flowers.
Sources: 13,21,24,38,49,67,69; B,C,I,K,L,M

***I. sibirica* ‘Eric the Red’** — Reddish-purple flowers.
Sources: 13,38,48; C

***I. sibirica* ‘Gatineau’** — Large violet-blue flowers.
Sources: 21,38,48



***I. sibirica* 'Perry's Pygmy'** — Deep blue, plants only 20 inches high.

Sources: 21,48,69

***I. sibirica* 'Ruby Wine'** — Bright ruby-red flowers.

Sources: 38,48,52

***I. sibirica* 'Sea Shadows'** — Flowers mixed blue and turquoise.

Sources: 48,52,69

***I. sibirica* 'Snow Crest'** — Ruffled white flowers.

Sources: 21,48,66

***I. sibirica* 'Tycoon'** — Large deep violet-blue flowers.

Sources: 21,25,38,48,67,68

***I. sibirica* 'Violet Repeat'** — Bright violet flowers which are often produced intermittently after the main blooming season.

Sources: 48,52,69

***I. sibirica* 'White Swirl'** — Satin white flowers produced in abundance.

Sources: 21,38,48,52,66,69

***I. sibirica* 'White Magnificence'** — Large white flowers.

Sources: 38,48,52

Iris kaempferi — Japanese Iris — Members of this group are far more demanding than Siberian Iris as to soil conditions, but if the proper site can be provided, they are easy to grow and have few problems. It would be wise to avoid them altogether, however, if one's soil conditions do not approximate the following: quite acid, rich, and capable of retaining abundant moisture throughout the growing season. Anything else usually will produce inferior results. Full sun or partial shade is satisfactory. If lime is spread anywhere near the plants, fatalities quickly occur.

Given the above requirements, Japanese Irises have few problems and can be left alone without disturbance for many years. They are ideal for planting at the edges of ponds and streams, or in the border if the soil is moist. The leaves are narrow, like the Siberian Irises. The plants grow to a height of 2½ to 3 feet with flowering stems 3 to 4 feet tall. The large, 6-inch, flat-topped, beardless flowers come in shades of white, blue, rose, and purple, often with attractive combinations of color. Spring is the recommended planting time.

***I. kaempferi* 'Great White Heron'** — Semidouble, large, pure white flowers.

Sources: 66,69

Iris sibirica — *Siberian Iris*

***I. kaempferi* 'Jeweled Kimona'** — Flowers white with blue markings.

Source: 68

***I. kaempferi* 'Kagari Bi'** — Large rose-pink flowers.

Sources: 21,24,69; I

***I. kaempferi* 'Mahogany'** — Double deep red flowers.

Sources: 21,24,68; I

***I. kaempferi* 'Pink Frost'** — Double light pink flowers to 8 inches across.

Sources: 21,69

***I. kaempferi* 'Pin Stripe'** — Flowers white, penciled with bright blue stripes.

Sources: 66,69

***I. kaempferi* 'Purple and Gold'** — Velvety purple flowers with golden throats.

Sources: 21,68,69

***I. kaempferi* 'Rose Anna'** — Flowers mauve, veined with rich purple.

Sources: 21,24,68; I

Bearded Iris — Although these rank high on the popularity list in perennial gardens, they have several serious faults and cannot be recommended for most low maintenance situations. Division or reduction in size of the clump every third or fourth year is necessary to prevent deterioration and to maintain vigor. This process involves separating the rhizomes, specialized stems that creep near the surface of the ground, and replanting them about an inch below soil level in groups of three. The foliage, hence the new growth, should face outward; the leaves are cut back to about 6 inches. This usually is done as soon as flowering has finished; however, satisfactory results are obtained any time up to August.

The most serious problem with Bearded Iris is their susceptibility to attack by the Iris Borer. This is a worm which tunnels into the rhizome via the leaves. Aside from the damage the borer does to the plants, it opens the way to a bacterial infection known as Soft Rot. This is a foul-smelling rot which can infect the entire rhizome.

Control of borers and Soft Rot often necessitates digging up and discarding (burning) the affected rhizomes. In the autumn it is prudent to remove and burn old foliage on which borer eggs may overwinter. Systemic insecticides such as Cygon sprayed as the leaves begin to grow, and again just before flowering, will effectively prevent borer infestations. Elimination of the borers is the most effective prevention for the Soft Rot disease.

Bearded Irises are obtained in nearly every color, in fact the genus name *Iris* is the Greek word for rainbow. Tall Bearded

Irises bear flowers up to 8 inches across on stems 3 to 4 feet in height. Intermediate Bearded Irises range in height from about 15 to 24 inches with 2 to 4-inch flowers. Dwarf Bearded Irises are under 10 inches in height with 2 to 4-inch flowers. The Dwarf Bearded Irises appear to be less susceptible to borer problems than the other two groups.

Many hundreds of varieties are currently offered. Numerous nurseries specialize in *Iris* to the exclusion of all other plants. A large and flourishing society (The American Iris Society) devotes itself to the genus. As with the American Hemerocallis Society, a popularity poll is published yearly in the *Bulletin of the American Iris Society*. The following 12 Tall Bearded Irises are listed, in order of popularity, from the 1973 Poll of the 100 favorites:

I. 'Stepping Out' — Flowers white with violet margins.

Sources: 8,10,13,16,19,28,36,38,52,55,56,65,66,68,69; C,M

I. 'New Moon' — Large, ruffled, light yellow flowers.

Sources: 10,11,16,36,38,41,52,56,65; M

I. 'Babbling Brook' — Ruffled blue flowers with light textured veining, pale lemon-yellow beard.

Sources: 10,16,19,36,38,41,52,55,56,65,69; M

I. 'Debby Rairdon' — Excellent combination of white and soft yellow.

Sources: 10,16,19,36,38,52,55,56,65; M

I. 'Shipshape' — Intense medium blue.

Sources: 10,11,16,36,41,52,56,65; M

I. 'Pink Taffeta' — Heavily ruffled, light rose-pink.

Sources: 10,11,38,41,52,56,65; M

I. 'Dusky Dancer' — Very dark, velvety black-violet.

Sources: 10,11,16,19,36,38,41,52,56,65; M

I. 'Kilt Lilt' — Large flowers basically a blend of rich apricot and gold. Very ruffled.

Sources: 10,11,16,41,52,56,65; M

I. 'Cup Race' — Large, pure white flowers.

Sources: 10,16,19,28,38,41,52,65,69

I. 'Camelot Rose' — Large ruffled flowers. Combination of silky-textured orchid and bright burgundy-red.

Sources: 10,11,16,19,36,41,52,55,65,69; M

L. 'Lime Fiz' — Flowers shaded lime to pure yellow.

Sources: 10,11,16,41,52,65,69; M

I. 'Winter Olympics' — Large ruffled flowers of leathery substance. Pure white.

Sources: 10,16,19,36,38,52,55,65,69; M

Kniphofia**Torch-Lily, Red-Hot Poker, *Tritoma*
Lily Family (Liliaceae)**

Although newer cultivars are, in general, hardier than the older ones, Torch-Lilies do not survive some Boston winters and cannot be recommended for general use here. *Kniphofia uvaria* (often listed in catalogs as *K. pfitzeri*), is the best known, commonly offered species, but its bright red and yellow flowers are thought to be overly gaudy by many people. This shortcoming has been remedied in the modern cultivars through breeding and selection which has produced a much better range of softer colors.

All Torch-Lilies require rich, perfectly drained soils. Soggy conditions are fatal, and although a position sheltered from the wind should be selected, they should be in a location which receives full sun for most of the day. Divisions obtained from nurseries are usually small and take a few years to become fully established. Spring is the only time for planting or dividing. After five or more years, clumps may build up to 2½ to 3 feet in width; however, division will not be necessary for many years.

Torch-Lilies range in height, according to variety, from 2 to 4 feet when in blossom. The individual drooping flowers are tubular and arranged in dense poker-like racemes at the tops of the flowering stems. The long, rigid leaves are somewhat grass-like in appearance. These are bold plants in flower and are suitable either as single specimens or in groupings of not more than three placed 15 to 18 inches apart either near the front or middle of the border.

Kniphofia is frequently listed by the old name *Tritoma* in catalogs.

K. 'Alcazar' — Velvety textured rosy-red flowers. 3 feet.
Source: 44

K. 'Blastoff' — Flowers pure white, red at the top of the spike. 3 feet.
Source: 7

K. 'Comet' — Flowers orange-red. 2½ feet.
Sources: 7,24; I

K. 'Earliest of All' — Flowers coral-rose. Blooms earlier than most other cultivars and is one of the hardiest. 2 to 2½ feet.
Source: 67

K. 'Glow' — Flowers coral-red. 2½ feet.
Sources: 24,32; I

K. 'Golden Scepter' — Deep yellow flowers. 3 feet.
Sources: 44,67

K. 'Goldmine' — Burnished golden-yellow flowers. 3 feet.
Sources: 7,67; L

K. 'Maid of Orleans' — Dense spikes of pale yellow flowers which fade quickly to a beautiful ivory-white. 3 to 3½ feet.
Source: 67

K. 'Primrose Beauty' — Primrose-yellow flowers. 2½ feet.
Sources: 7,13,24,32,66; C,I,K,L

K. 'Robin Hood' — Bright orange-scarlet flowers. 2 feet.
Sources: 13,44; C

K. 'Rosea Superba' — Flowers on the lower ⅔ of the stem are pure white; on the upper ⅓, pinkish-red. 2 feet.
Source: 67

K. 'Royal Standard' — Top flowers bright red; bottom, yellow-shaded to cream. 3 feet.
Sources: 24,66; I,L

K. 'Springtime' — Flowers on lower ½ of stem are ivory-white; those on top, bright coral-red.
Sources: 13,32,44,67; C

K. 'Vanilla' — Flowers clear pale yellow. 2 feet.
Source: 67

K. 'White Giant' — Flowers ivory-white, 3 feet.
Sources: 13,24,32,44,66; C,I,L

K. *nelsonii* var. *major* — A dwarf species with deep orange-scarlet flowers. 2 feet.
Source: 67

K. *uvaria* (syn. *K. pfitzeri*) — The typical old-fashioned form of Red-Hot Poker with scarlet upper flowers and yellow lower flowers. 3 feet.
Sources: 44,66; A,J,K,L

***Liatis* Blazing Star, Gayfeather, Button Snakeroot Daisy Family (Compositae)**

It is rather unusual that a member of the Daisy family should have flowers which are arranged in a dense spike formation. It is also unusual for flower spikes to start blooming from the top and continue downward, but most all *Liatis* do this. The exceptions are *L. scariosa* 'September Glory', and its sport, *L. scariosa* 'White Spire'. These open their flowers more or less simultaneously. All the commonly grown species provide excellent flowers for cutting purposes, but these two are probably the best.

Liatis are upright plants which appear best when planted sparingly rather than as large masses. They will tolerate considerable moisture during the growing season, but soggy soil conditions during the winter will lead to rapid deterioration of the clumps. (This is particularly important to note with *L. pycnostachya*, *L. scariosa*, and their several cultivars.) A mod-

erately fertile sandy soil and a position in full sun are about the only other requirements for *Liatris*. Division will be necessary sometime after the fourth year, depending upon growing conditions.

Stems of taller growing *L. pycnostachya*, *L. scariosa* 'September Glory', and *L.* 'White Spire' have a tendency to lean under their own weight and may require staking. For the gardener with stringent requirements for minimal maintenance, the lower-growing varieties would be best.

L. pycnostachya — Cat-tail or Kansas Gayfeather — Dense 5-foot spikes of purple or pinkish-lavender flowers in August and September. Stems well clothed with leaves.

Sources: 13,24,27,32,46,57,68; A,C,I,K,L

***L. pycnostachya* 'Alba'** — White-flowered cultivar of the preceding species. 4 feet.

Sources: 67; K

L. scariosa — Tall Gayfeather — Purple flowers on 2 to 3-foot stems. Flowers in late August and September.

Sources: 4,24,57; I,K

***L. scariosa* 'September Glory'** — Purple flowers which open almost simultaneously along the 5 to 6-foot stems. Late September.

Sources: 7,24,32,66,67,69; C,I,L

***L. scariosa* 'Snow White'** — Pure white flowers on 4-foot stems in late August and September.

Sources: 24; I

***L. scariosa* 'White Spire'** — A white-flowering sport of *L.* 'September Glory'.

Sources: 7,13,32,49,66,69; C

L. spicata — Spike Gayfeather — Bright purple flowers on 3-foot stems. Will tolerate wetter conditions than the other species.

Sources: 4,13,14,59,66,68; B,C,

Liatris spicata — *Spike Gayfeather*. The flowers begin to open at the top of the spike.





Liatris spicata — *Spike Gayfeather*

L. spicata 'Kobold' — Flowers dark purple, plants of compact growth habit.

Sources: 24,32,49,57,69; I,J,K,L

L. spicata 'Silver Tips' — Flowers lavender with a silvery sheen. 3 feet.

Source: 67

L. 'August Glory' — Deep bluish-purple flowers in August.

Source: 7

L. 'Orchid Pink' — Orchid-pink flowers on 5-foot spikes from mid-July into September.

Source: 7

Ligularia clivorum 'Desdemona'

***Ligularia clivorum* 'Desdemona'**

**Var. of Bigleaf-Goldenray or Golden Groundsel
Daisy Family (Compositae)**

Several species and cultivars of *Ligularia* could be used in our area, but this is the only one which seems available from nurseries at the present time. It is a bold, handsome plant with large purple tinged leaves up to 12 inches across; for these alone, the plant would be well worth growing. In mid- to late August, branched flower stalks 2½ to 3½ feet in height bearing numerous 2-inch orange-yellow flowers are produced. These last into early fall.

Plants are quite sensitive to drying out, and a good rich soil which contains ample organic matter should be provided. A position in partial shade is preferable to full sun where the large leaves are subject to wilting, especially after extended cloudy or rainy periods. They soon recover from this, however.

Large clumps up to 2½ feet wide are formed in fairly short order, so ample space should be provided at planting time; they can remain in place for years without requiring division. This plant often is found listed in catalogs under the genus name *Senecio*.

Sources: 13,24,68,69; C,I



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ARNOLDIA

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The Director's Report

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR
ENDED JUNE 30, 1974

The Arnold Arboretum has been described accurately as "Boston's finest park" and an "oasis of beauty within the city." As events of the past year indicate clearly, it is not completely isolated but is affected directly by national and international trends as well as by those within the city and the University. Activities reflecting the past, developing in the present, and anticipating the future all are seen in a review of the past year. Four events, two negative and two positive, seem to stand out.

The national fuel crisis and inflation affected, and continue to affect, all of our operations. The difficulties the staff had in reaching the Arboretum because of a shortage of gasoline were paralleled in temperature reductions to conserve fuel in buildings and in greenhouses, and in the necessity for reduction of the use of gasoline-fueled equipment. Higher costs of supplies and shortages of materials are having a direct impact on our operations.

A well-developed plan by the City of Boston to build a 1,200-student school on the South Street tract of the Arnold Arboretum came as a complete surprise to the staff. The University cooperated in our defensive action. We appealed to our federal representatives, and secured support from the National Park Service in view of the designation of the Arnold Arboretum as a National Historic Landmark. We are grateful, also, for the actions on our behalf by the Jamaica Plain organizations, our neighbors. After several meetings, the city officials agreed to look for an alternative site, and hopefully that crisis is over. The land involved has been a part of the Arnold Arboretum since 1923, and is essential as the only area for future development of the collections.

On the positive side, the financial and physical contributions of the Friends of the Arnold Arboretum have increased. With a special gift, the top of Bussey Hill was redesigned, and the landscaping and planting have been completed. An excellent educa-

tional film on Poisonous Plants was completed, again with contributions of the Friends. The Volunteers contributed hundreds of hours of talented labor, from guiding tours to helping with staff projects. Along with all of this, an increase in staff research is evident in the larger number of scientific papers published by the staff.

Finally, we see a hoped-for solution to the crowded conditions and improper housing of books and specimens, and of staff, in the Harvard University Herbaria building in Cambridge. The University has agreed our needs are real, has authorized planning, and will support a search for funds to make an addition to the building. The years ahead offer a challenge and an opportunity for further development and contribution of the Arnold Arboretum.

Staff

We report with regret the death of Karl Sax, on October 10, 1973. Dr. Sax was Professor of Botany, Emeritus, at Harvard University, Director of the Arnold Arboretum from 1946 to 1954, and a member of the Arboretum staff from 1928 until his retirement in 1959. A biographical paper reviewing his many contributions in the botanical fields of cytology and genetics, in horticulture, and in demography, and listing his 181 publications, appears in the October 1974 issue of the *Journal of the Arnold Arboretum*.

Through resignations we lost the services of Miss Nancy Page as Coordinator for Community Activities, and of John Link as Curatorial Assistant. John Dunn, of the grounds crew, reached retirement age during the year and, due to ill health, Harry Hill, a stalwart in the greenhouses, retired with a medical disability. We wish them all well.

Miss Kathleen Clagett was appointed Editorial Assistant to help with the *Journal of the Arnold Arboretum*. Dr. Peter F. Stevens, a specialist on the flora of New Guinea and tropical Asia, joined the staff in October 1973 as Assistant Curator. In a joint appointment with the Gray Herbarium, Dr. Norton G. Miller of the University of North Carolina, has been approved as Associate Professor and Associate Curator, the appointment to become effective early in 1975.

Dr. William Gillis received a special appointment as Research Fellow for the year to further his work on the vegetation of the Bahama Islands. Four Mercer Research Fellows for all or part of the year were Dr. Yin-Tse Lee (Taxonomy), Dr. Umesh Ban-



South Street tract. Photo: P. Bruns

erjee (Cytology and Palynology), Miss Martha Dahlen (Horticulture), and Mr. James Wolpert (Horticulture).

Honorary appointments were approved for Mrs. Ara Derderian (Honorary Curator of the Bonsai Collection), Ms. Stephanie Sutton (Honorary Research Fellow), and Dr. Arturo Gómez-Pompa (Honorary Research Associate in the Gray Herbarium and the Arnold Arboretum).

Special honors came to two staff members. Dr. Donald Wyman, Horticulturist, Emeritus, was recognized by his alma mater, Pennsylvania State University, with a "Distinguished Alumni Award." The University noted his "scientific skill and award winning research on woody plants and . . . his ability to translate that skill to popular use . . . for helping the world to bloom in beauty." Dr. Howard was honored at the annual meeting of the National Council of State Garden Clubs with the presentation of the "Gold Seal," the highest award offered by the Council.

Dr. Shiu-Ying Hu completed twenty-five years of employment at Harvard University, and was among the University employees honored with a certificate and a Harvard chair.

Community Service

During the past year an attempt was made to have one person coordinate all community requests for horticultural information and plants. Miss Page represented the Arboretum in this capacity, and the duties she filled have been distributed among other staff members while the position is being reconsidered. During the fall of 1973, Miss Page attempted to coordinate the distribution of plants from the Arboretum nursery which were surplus to our immediate needs. After a choice has been offered to the University, as specified in our indenture, the remaining plants rarely are of sufficient quantity or type to work into a comprehensive landscape scheme. Nevertheless, Miss Page worked with eight groups in the South End, Back Bay, East Boston and Dorchester, where theoretical as well as practical information was needed, and each group wished to improve the local environment. In each case it was necessary to check the site, discuss the materials suitable for the area and the purpose, and give instruction in methods of moving, replanting, and caring for the plants chosen. Miss Page also served on the Cambridge Conservation Commission and the Charles River Watershed Association.

In 1973 the Arboretum was asked by the Exploring Division, Boy Scouts of America, to offer an Explorer Post in forestry and horticulture. Miss Page and Mrs. Burch agreed to coordinate a program involving work at the Arboretum, including lectures and demonstrations by other staff members, and visits to other appropriate areas or organizations. Fifteen participants were selected from over fifty who applied; but during the year the group dwindled to five regular and very interested persons, and three who were sporadic in attendance. Since the programs were held after school and on weekends, a considerable dedication was required by both the leaders and the participants. The attrition rate was not considered unusual by the Exploring Division, but the amount of time devoted to the program challenged the value of staff participation in such a formal presentation. Perhaps the same goal could be attained by encouraging those interested to apply for student laborer positions at the Arboretum during the summer months.

*State Labs framed by early
spring greenery in the Arboretum.
Photo: P. Bruns*



Staff members have participated in other community programs in the three localities in which the Arboretum is represented. Dr. DeWolf has been a member of the Horticulture Planning Committee of Friends of the Public Garden. Mr. Pride serves on the Building Committee of the Franklin Park Zoo, and other staff members have offered suggestions on plants to be used in the proposed new environmental units. The Boston Conservation Commission plans to start a municipal composting program, and asked the Arboretum for advice and guidance. Several staff members served as judges at the Massachusetts Horticultural Society spring flower show, and that of the Worcester County Horticultural Society; for the Dorchester-Roxbury 4-H show, as well as science fairs in three cities. Miss Page and Mr. Hebb worked with the planning group of the City of Boston Park Department in midwinter, teaching principles of vegetable gardening to community leaders who work with the applicants for land to garden.

Active discussions of the role of women in American society have taken place nationally and locally in the past year. Dr. Schubert served on the Steering Committee of Women Employed at Harvard. Another group, planning a program in the Hynes Auditorium in Boston with much local participation, asked the Arboretum to have an exhibit of poisonous plants. While the male members of the staff were permitted to set up the exhibit, only ladies from the staff and Volunteers could "man" the booth during the day.

Within the University every year, the Arboretum makes surplus plants available to the Department of Buildings and Grounds. Dr. Weaver and Mrs. Burch are completing a requested survey of the plantings of the Business School area, supplying correct identifications for the specimens.

Horticulture

The Arnold Arboretum, to most people, is a collection of flowering trees and shrubs. It is the primary duty of the staff to maintain this collection and, in fact, the major part of the budget is so allocated. Although one expects such a collection to be static, there is a significant amount of replanting and replacement necessary. Trees have a life span, and as older ones become dangerous or stagheaded through disease or storm damage, they may be propagated and replaced by younger specimens. Unfortunately, not all young plants placed on the grounds prove hardy, and death of specimens may be due to dryness or

*Planting White Pines on Bussey Hill.
Photo: R. Hebb*

to cold. Records are kept of such losses, and the same plant species may be tried another time from a different source or in a different location. Accidental destruction of young plants does happen, and the theft of small plants is a fact of life.

The past year saw the addition of 1,810 plants to the grounds, representing the largest planting schedule for fall and spring attempted in recent years. The superintendent, the assistant horticulturist, and the grounds crew are indeed commended for this accomplishment. A special gift enabled us to make often-contemplated changes in the area of Bussey Hill, the second highest point within the Arboretum, offering vistas of Boston and the Blue Hills. We engaged Mr. Vincent Merrill, of the firm of Shurcliff, Merrill and Footit, to draw plans and supervise the project; a contract was let to the R. J. Delmonico Corporation of Hull, Massachusetts, for the basic construction. Plantings were designed in collaboration with the Arboretum staff to provide floral display through the growing season, and to feature a collection of summer blooming shrubs.

A small grove of pines has been accentuated with additional hilltop planting of the species. Curved paths and steps edged with granite offer a sloping access from the roadway, and several benches have been provided. A rail fence between granite posts delimits part of the area; a paved portion still permits buses to be taken to the hilltop during conducted tours. The







Above: View from Bussey Hill after renovation. Photo: P. Bruns

Left top: Construction of new overlook area on Bussey Hill. Photo: R. Hebb

Bottom: New granite steps offer sloping access to new planting. Photo: R. Hebb

completed area is extremely attractive, and is the first major renovation within the Arboretum in several decades. We are most grateful to our Friends for this contribution to the beauty and usefulness of the grounds.

We welcome visitors to the grounds which are open to the public from sunrise to sunset. During the summer months these hours exceed the normal work schedule of the staff. Again this year we found it necessary to engage a private security guard for patrol four hours of the evening, seven days a week. During weekends in May, this protection was supplemented with two off-duty policemen on motorcycles. We do not appreciate the nighttime visitors nor the picnickers who leave trash for the staff to collect in spite of the large number of trash barrels available. Trash pick up, which ran at the rate of 100 man-days per year in 1960, has jumped to 479 man-days in 1973. This is the equivalent of 1½ men full time, plus vehicles. Once the rubbish is collected, the Arboretum also must hire disposal companies to remove it.

The lack of public toilet facilities remains a problem at the Arboretum. A survey by the Boston 200 Bicentennial study groups indicates that this is true generally for all of Boston. During the spring and summer months, we have rented two portable toilets; these have been placed within a locked fence enclosure in a secluded spot on the grounds. Although serviced regularly by the supplier, the units are still subject to vandalism.

A program of soil sterilization was implemented for the nursery area at the greenhouses. In the past whenever balled plants were removed from the nurseries, the resulting craters were filled with soil from a stockpile where weed seeds and rootstocks are abundant. In recent years this has led to an infestation of Canada thistle (*Cirsium arvense*), which has fragile horizontal roots 2 to 10 inches below the surface. A general use of an herbicide is not possible, considering the wide variety of taxa grown and the unknown effect of herbicides on many plants. To remedy the situation, it was decided to sterilize the soil with methyl bromide. All plants were removed from the area; the soil was deeply rototilled, covered with large sheets of polyethylene plastic, and fumigated for five days with the methyl bromide. This treatment appears to have worked extremely well on both dormant seeds and living root or stem portions. When a heavy mulch is applied, any new weed plants are easily removed.

A small portion of land within the Arboretum is a pre-Revolutionary War cemetery, known as the Walter Street "Berrying"



*Two visitors enjoy the view from summit of newly-renovated Bussey Hill.
Photo: P. Bruns*

Ground. This is all that remains of the second oldest church in the Jamaica Plain area. Care of the cemetery was given to the Arboretum in 1923. The West Roxbury Historical Society, anticipating the national Bicentennial, proposed a new survey of the cemetery, and volunteers from that organization have polished the plaques and will recondition some of the stones. The area will receive additional plantings of native species as used in the early period to make the area more attractive.

The Arnold Arboretum serves as the national and international registration authority for cultivar names in specific genera. We also accept for registration cultivar names in groups of woody plants not otherwise represented by special authorities or societies. The number submitted varies from year to year, with twenty new cultivars having been registered during this past fiscal year. Brief descriptions of these new cultivars have been published in *Arnoldia*, but in the future this listing may be in the *Bulletin of the American Association of Botanical Gardens and Arboreta*.

The records of our collection are incorporated in the computer-processed files of the Plant Record Center, American Horticultural Society. The original printout developed several years ago showed clearly that some types of desired information were not readily available. Mr. Hebb, with the assistance of Volunteers June Hutchinson and Corliss Engle, has worked on the records, tracing back each entry to the original source. A given plant in our collection may have been propagated from another plant living or dead, and the present computer record shows only the immediate source of the specimen. As a result of this effort by Mr. Hebb and his assistants, every card in our files now shows the original source of the material, and this will be added to the computer-stored information for future printouts. In scanning our records for this information, we have compiled data on all plants still living in our collection that came from known locations in Asia. The collectors, including Wilson, Jack, Sargent and others, are now indicated. Eventually this might have been obtained by a special program developed for the computer, but the information is now on hand in readily available form.

Taxonomic work on the living collections is a regular activity involving several staff members. Herbarium specimens are prepared for our own herbarium and for material to be used in exchange. Volunteers at the Arboretum have been most helpful in collecting and processing such material, and have filled many special requests from other arboreta and herbaria for herbarium

material. Some special studies have had most unusual results. Dr. Spongberg, in his work on a manual of cultivated plants, noted that one specimen of *Stewartia* in our collection retained its fruits throughout the winter in an attractive fashion. The tree was grown from seed obtained from the Lu Shan Arboretum, Kuikiang, China, in 1936, and had been identified as *Stewartia sinensis*. Further study revealed other distinctive characteristics and differences from true *S. sinensis*, and established that the plant should be recognized as a new species, now named *Stewartia rostrata*. Herbarium specimens of this species are to be distributed to other herbaria.

Dr. Lee, investigating the Leguminosae of China, studied our oriental material of *Gleditsia*. Again, some specimens growing on the grounds are not what they have been called, and only further study will determine if a new name is needed, or whether some previously published name is available for this species. In the course of his work, Dr. Lee was able to obtain pods of *Gleditsia* from an herb shop in Hong Kong. The seeds proved viable, and a new introduction is now growing in the greenhouses for future trial on the grounds.

The irregular and very scanty production of viable seeds by our plants of the paperbark maple, *Acer griseum*, was called to the attention of Dr. Banerjee as a possible cytological problem. Although several plants produced typical winged maple samaras regularly, these rarely had developed seeds. Other plants have produced few or no samaras. In a very rare year, fertile seeds would be numerous. The solution to the problem was amazingly simple. Some specimens proved to be functionally male, and others functionally female. The distance between the trees was too great for regular pollen distribution in one case. In the instance of two adjacent trees, the pollen matured at one time, while the stigmas were receptive at another. Hand pollination with stored pollen has proved to be effective in the production of viable seeds.

Dr. Howard continues his studies of the growth characteristics of the plants in the living collection. It is now clear that the patterns of vegetative growth and flower and fruit production do not fit into the published descriptions that have been developed primarily from tropical plant studies.

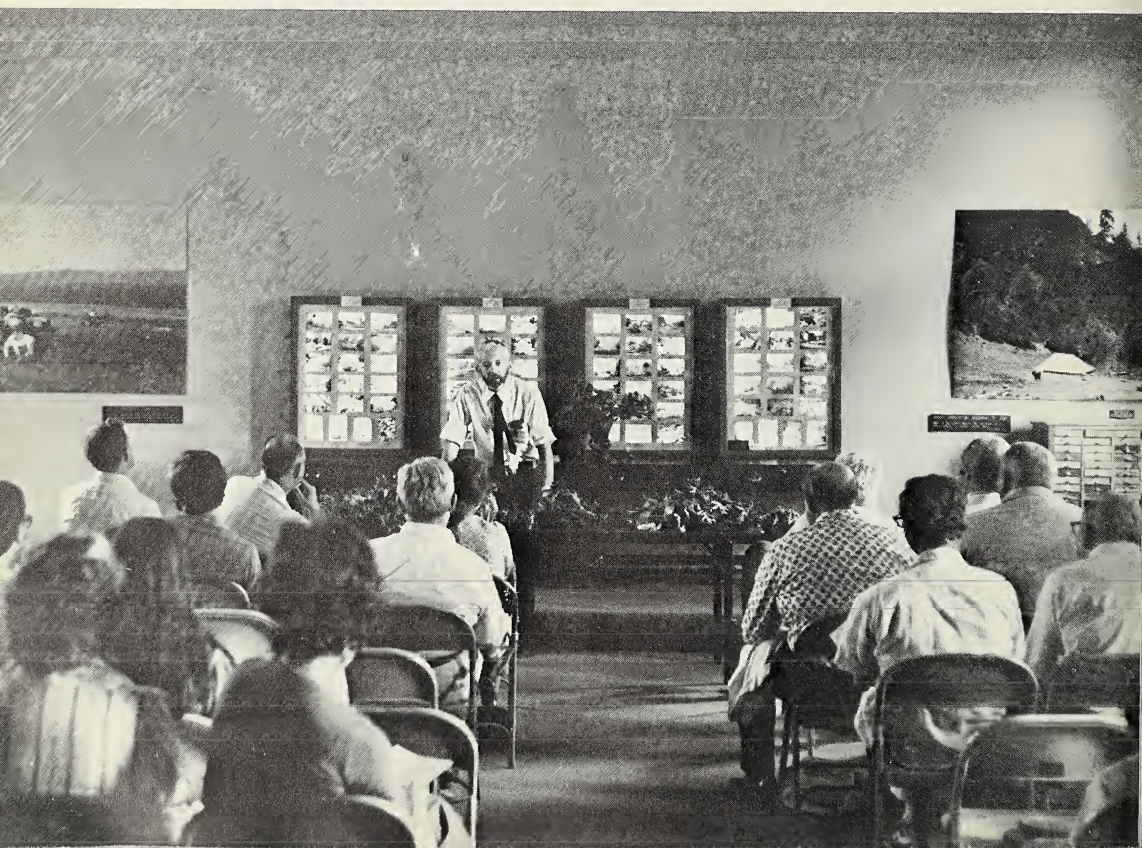
During the fiscal year, 123 shipments of plant material, comprising 507 taxa, were sent to cooperating institutions, nurseries, and individuals in the United States and nine other countries. A total of 143 shipments, consisting of 600 taxa, was received

from 23 countries. Not all of the material acquired is destined for planting on the grounds. Many seed lists are received which contain offerings of scientific interest to staff members, and seeds are supplied generously in a mutual exchange for individual research projects.

Plants in our collections which appeared to be failing, or for which additional specimens were needed, were propagated in numbers totaling 154 taxa. Twenty-three items were propagated asexually to fill special requests, primarily for material which would be open-pollinated, and therefore variable if grown from seed. These were materials that could not be expected to come true from open-pollinated seed; we are not in a position to do controlled cross-pollinations.

Seeds obtained on request from index semina are without propagation data. Each becomes an experiment, and if the seed number is sufficient, several methods of treatment may be employed. Our collections are subject to the same type of investigations on a continuing basis. The propagator studied 79 taxa during the year for propagation data, while an addition 37 taxa represented studies for seedling and transitional morphological characteristics.

The Arnold Arboretum was the local host organization for the International Shade Tree Conference in August 1973. Superintendent Robert Williams was local arrangements chairman.





Above: Equipment demonstration at the International Shade Tree Conference. Photo: P. Bruns

Left: Dr. Gordon P. DeWolf, Jr., lecturing on poisonous plants to members of the conference. Photo: P. Bruns

Dr. Howard was the opening speaker and showed the Centennial film. The group had an open house day at the Arboretum, with a demonstration of tree maintenance equipment arranged by Mr. Williams. Luncheon was served under tents in the greenhouse area for the largest group ever so accommodated on the grounds. Lecture-demonstrations during the day were presented by Mrs. Derderian and Messrs. DeWolf, Fordham, Howard and Weaver.

The Annual Meeting of the National Council of State Garden Clubs was held in Boston in the spring. The landscape design council of this group had tours and a luncheon at the Case Estates, and the meeting participants toured the grounds by bus later in the program. Gift plants and seed packets were supplied. The Region One meeting of the Garden Club of America met at the Arboretum later for tours, talks and a luncheon. For the first time in many years, the Massachusetts Horticultural Society also offered a tour of the Arboretum for its members, with Dr. Howard serving as guide.

Plant distribution to the Friends during the year consisted of two offerings. Surplus plants from the nurseries were distributed at the Case Estates in the fall; during the spring, small seedlings of *Maackia amurensis* were mailed to each Friend. Members of the Volunteers packaged the seedlings and took care of the mailing. The Amur Maackia, an Arboretum introduction, is a good summer-flowering shade tree, rarely available from commercial sources.





Above: At Case Estates, plants are distributed to the Friends. Photo: P. Bruns

Left: Volunteers pack Maackia amurensis seedlings at Dana Greenhouses. Photo: A. Fordham

Case Estates

The Case Estates in Weston, Massachusetts, although separated physically from Jamaica Plain, are an integral part of our horticultural collections. Plants started from seed or by vegetative propagation in the greenhouses in Jamaica Plain are transferred, while of small stature, to the Case Estates where they increase in size, are checked for identification, and are evaluated for their possible addition to the main collection in Boston. The grounds, therefore, consist of nursery areas, display plantings of several types, and holding collections of plants which cannot be accommodated in Jamaica Plain or are not desirable for collections there. Staff members who live on the grounds offer surveillance of the Case Estates collections and supply guidance to visitors. Land is used for experimental work and for special studies; a small lecture room is used for classes and public lectures. Four popular classes were held in Weston during the year, tours of the plantings were offered to various groups, and some classes of Weston schools or those of other towns visited the area for instruction. A special pruning demonstration, offered by the Arboretum staff, drew 80 people on a rainy day. Occasional meetings of the American Rock Garden Society, the American Hemerocallis Society, and the American Rhododendron Society convened at the Case Estates during the year. A special meeting of the Landscape Design Council of the National Council of State Garden Clubs was held on the grounds with tours included.

The ground cover display plots are among the display plantings drawing the greatest amount of visitor attention. Although many of these beds are truly low maintenance plantings, others require more attention than would lawn grass. We have begun a four-year program to rejuvenate the display area. The water supply to the nursery areas was extended during the spring season by the installation of plastic piping into the beds.

The Town Engineer of Weston and the Sidewalk Committee completed their proposals for the widening of Wellesley Street. A plan acceptable to the staff has been recommended to the Harvard Corporation for cooperative action. The proposal will be presented to Weston residents for financing at a special town meeting in the fall.

Herbarium

The Arnold Arboretum's herbarium, a collection of dried plant specimens mounted on sheets of rag paper, is one of its

major resources, along with the living collections and the library. All are used by the staff in a variety of ways. The dried herbarium specimen is always available as a source of information. The specimen is a record that a given plant was growing in a specific area; hence, documents a geographic distribution. The dried specimen can be analyzed for chemical content, or reconstituted by being softened for a study of its structure or its internal anatomy. As specimens are studied by the staff or by others, annotations on the sheet increase the value of the specimen. The specimens essentially last forever, and are frequently examined. The quality of the herbarium and its maintenance is a legacy to this generation of botanists and a reflection of the interest of the staff. The herbarium of the Arnold Arboretum is the fifth largest of all herbaria maintained by a University staff, and that part of it representing plants under cultivation in Jamaica Plain is the largest anywhere. The curating of this collection has been, and currently is, unexcelled. However, past reports of the Director have called attention to the fact that the herbarium in Cambridge has grown beyond the capacity of the steel cases, which are considered to offer the best protection for such specimens. Currently, 2,371 cardboard boxes are used to house mounted herbarium specimens of the Gray Herbarium and the Arnold Arboretum; and represent the equivalent of 140 steel cases. The cardboard boxes have been placed on top of cases throughout the herbarium, and are not insect proof, therefore endangering the specimens. Also, ladders are required for the staff to reach the specimens so stored. The arrangement is inefficient, and an unsatisfactory housing of specimens. Crowded conditions also exist in the library, and in both the library and the herbarium the staff has inadequate space in which to work. Students cannot be housed in the building, and the space for classes, laboratories and lectures has become inadequate. During the fiscal year the University administration authorized a further study of the situation, and with the cooperation of the University Planning Office, plans were drawn for an addition to the Harvard University Herbaria building. The proposed addition will cost two million dollars, with an additional million dollars required as an endowment for future maintenance. The University has agreed to officially support a drive for the necessary funds to make this addition of space and facilities. Even anticipating a successful appeal, the time required for the preparation of architectural drawings and construction means that crowded conditions will exist for another five years.



Friends and staff join in honoring Dr. Richard A. Howard on the occasion of his 20th anniversary as Director of the Arnold Arboretum. Photo: P. Bruns

A small increment of space will be available during the next fiscal year through the use of three rooms in the Museum of Comparative Zoology. These quarters are being renovated in equal thirds to house Dr. Wood and his associates working on the Generic Flora of Southeastern United States; the herbarium of the New England Botanical Club, a responsibility of the Gray Herbarium; and some portions of the combined herbaria. Access

to this space will be possible from the third floor of the Harvard University Herbaria building.

A curatorial grant from the National Science Foundation has been in effect for two years, supplying funds for curatorial work in the Farlow Herbarium, the Botanical Museum, the Gray Herbarium, and the Arnold Arboretum. A third year of support now has been approved. The grant has been used to increase the mounting of specimens to reduce the backlog of stored, inaccessible collections in each of the four institutions, for retroactive binding of books, for processing of herbarium loan requests, and for services to other botanists working with these collections of national significance.

The move of the collections of wood samples and microscope slides to new quarters was completed during the year. Laboratory work space associated with the collections has been improved by the move. New slide holders were purchased to permit more compact and efficient storage of the slides. The wood collection has been officially designated as the Bailey-Wetmore Laboratory of Plant Anatomy and Morphology.

During the year, 26,069 specimens were mounted and inserted in the Arnold Arboretum herbarium, bringing the total to 1,026,459; 154,044 represent plants under cultivation and are housed in the Administration Building in Jamaica Plain. The Arboretum received 13,971 specimens by exchange, as gifts, as subsidy of collectors, or for identification. A total of 3,677 specimens was distributed in exchange or sent as gifts to other institutions. Loans numbering 176 from 57 institutions, and totaling 20,948 specimens, were borrowed: 92 loans totaling 11,735 specimens for students, and 84 loans totaling 9,213 specimens for 10 staff members. Requests to the combined herbaria for specimens to be loaned were filled when possible with 172 loans to 87 institutions, comprising 24,522 specimens. Of these, 54 requests were from institutions in the United States; and 33, from institutions in 18 other countries. For the first time in several decades, communication has been re-established with scientists of the People's Republic of China. We have received publications, seed lists, and requests for photographs and specimens. In an exchange of herbarium specimens, the Arnold Arboretum received some from *Academica Sinica* and has sent comparable materials.

The staff is involved in many types of research projects, and those dependent on the herbarium are represented by floristic studies and monographs. Dr. Hu is preparing a flora of Hong

Kong of the New Territories. Drs. Wood and Robertson continue work on a generic flora of the Southeastern United States. Dr. Howard is studying the vegetation of the Lesser Antilles, with the ultimate goal a flora of the area. Dr. Gillis is working on a flora of the Bahama Islands, including the Turks and Caicos Islands. Dr. Spongberg continues his work toward a revision of Rehder's *Manual of Cultivated Trees and Shrubs of Eastern United States*. Dr. Schubert conducts special studies of the genera *Desmodium*, *Begonia* and *Dioscorea*. Dr. Lee is studying the Leguminosae of China. Dr. Stevens continues his studies of the Ericaceae, primarily of Asia, and is undertaking a revision of the genus *Calophyllum*. Dr. Weaver is investigating the tropical genera of the Gentianaceae.

Scientific studies by the staff may be published in the *Journal of the Arnold Arboretum* or in other botanical journals. There is always a period of time between the completion of a paper and its appearance in print; in some botanical journals this may be a matter of years. For that reason, the staff has priority in the *Journal of the Arnold Arboretum*. Contributions of former staff members, representing work done while at the Arboretum, appeared during the year. Miss Dulcie Powell is the author of a study of the introductions and distribution of plants by Captain William Bligh in the voyage following the mutiny on the *Bounty*. Her study, entitled "The Voyage of the Plant Nursery, H.M.S. Providence, 1791-1793," was published by the Institute of Jamaica. Before joining the Arboretum staff, Dr. Thomas Hartley collected extensively in Papua and New Guinea plant materials that were to be analyzed by chemists for the alkaloid content and other significant constituents. Identifications were completed in the Arboretum herbarium, but publication was delayed until the chemists completed their work. The article, "A Survey of New Guinea Plants for Alkaloids," comprising 102 pages, and considering 2,310 species of 172 families, was published in the journal, *Lloydia*, by Dr. Hartley and four co-authors. This is a major addition to our knowledge of plant chemicals and their distribution in various plant families.

A former Mercer Research Fellow, Dr. S. M. A. Kazmi, of Pakistan, used the library of the Arnold Arboretum during his stay in Cambridge to prepare a comprehensive bibliography of literature on the flora of Pakistan. The fourth portion of his work entitled "Bibliography on the Botany of West Pakistan and Kashmir," has been published by Field Research Projects in Miami, Florida. Two family treatments for the generic flora of the Southeastern United States were published by former

staff members Dr. A. Linn Bogle of New Hampshire, and Dr. Thomas S. Elias of the Cary Arboretum.

Dr. Howard has had a project of long duration, a survey of the nature of the distribution of the vascular tissues in the stem and petiole of the families of the Dicotyledonae. Information on each family is to be included in the projected revision of Metcalfe and Chalk's *Anatomy of the Dicotyledons*. A survey paper, needed for the first volume of that work, was published in expanded form in the *Journal of the Arnold Arboretum* as "The Stem-Node-Leaf Continuum of the Dicotyledonae."

The National Science Foundation has a Special Foreign Currency Program for Research, Science Education, and Related Activities, which will consider research proposals from institutions in countries where U.S.-owned foreign currencies exist. Each organization applying must have a cooperating U.S. scientist or scientific organization. Two scientists in Pakistan submitted proposals related to the work of the Arnold Arboretum, and we have agreed to cooperate with them. The University of Islamabad wishes to establish a University Herbarium, and to have the Arnold Arboretum assist in the identification and distribution of herbarium specimens. The Arboretum herbarium has a good representation of specimens from India, China and Malaysia, but few from Pakistan. We believe the cooperation will be mutually beneficial. Dr. Kazmi received approval for his proposal to collect and publish on the cultivated woody plants of Pakistan. Again, the Arboretum wishes such herbarium specimens and will cooperate in identification and distribution of such specimens. Both projects, paid for in U.S.-owned Pakistani rupees, can progress without direct costs to the Arnold Arboretum. It is probable that some staff member will be able to visit the two organizations in Pakistan during the course of the projects.

Dr. Schubert serves as secretary of the Standing Committee on Stabilization of Specific Names appointed by the General Committee of the International Botanical Congress. Several meetings of the committee were held in Cambridge, and a report was submitted for consideration in the Nomenclature Section of the 12th Botanical Congress to be held in Leningrad in June, 1975.

Library

Ms. Sheila Geary, who has the daily library responsibilities in Jamaica Plain, was granted a maternity leave of absence during the year, and has returned to duty. We particularly appreciate



Witches'-broom seedlings growing in Dana Greenhouse area. Pinus sylvestris is in foreground; P. resinosa is at rear. Photo: A. Fordham

the services of several of the Volunteers who helped in the library during her absence.

The rapidly increasing costs of books and periodicals is of great concern. A greater coordination of purchasing with the Harvard libraries is developing so that duplication of general topic volumes can be reduced. The proper selection of volumes within areas pertinent to the work of the staff can be a part of the responsibility of the library committee. In spite of rising costs of publication, new periodicals continue to appear, and subscriptions to four scientific journals not available on exchange were added during the year. The Arboretum has two special endowment funds created by Charles S. Sargent and

Mary R. Sargent for the purchase of books. At one time the income from these funds was sufficient to meet the annual needs for book purchase and book binding. At the present time, this income is less than half the annual cost of purchases alone, and the remainder is derived from unrestricted funds. A program of reconditioning historical volumes was aided again this year by the Massachusetts Council on the Arts and Humanities. Some money from the curatorial grant of the National Science Foundation also can be used for retroactive binding and book care.

The staff receives and seeks gift volumes from publishers as review copies. Reviews are published in *Arnoldia*, but not in the *Journal of the Arnold Arboretum*. Although the benefit may be considered mutual, we are grateful for these books.

The holdings of the Library of the Arnold Arboretum were increased by 904 items to a total of 82,813 catalogued volumes. Currently, 641 periodicals are received by the Gray Herbarium and the Arnold Arboretum, forming a truly excellent library for botanical and horticultural research. Additional microfiche of herbaria and books are purchased jointly, with a current holding of 10,814 such items.

The biography of Joseph Rock, a former collector for the Arnold Arboretum, has been accepted by Hastings House Publishers, Inc., New York. The author, Ms. Stephanie Sutton, Honorary Research Fellow, is currently reading proof and preparing the index. The volume is expected to be issued during 1974.

The Society of Printers met at the Arnold Arboretum in May, at which time Dr. DeWolf spoke on the plagiarism of botanical illustrations, tracing the history of original illustrations and the examples of alterations as these were copied in subsequent editions or for other publications. Many fine examples are in the Arboretum library, and they cover well over four centuries of publishing.

Education

Education has many definitions; the sharing of information or knowledge may be the most common meaning. This represents a major facet of the daily activities and operations of the Arnold Arboretum and its staff. A living collection of labeled plants is open to the public, as are various exhibits and displays within the Boston area. The staff answers questions by telephone and by letter, and teaches formal and informal classes, and conducts tours for visitors. It also shares its knowledge through public lectures, TV appearances, and publications.

During the spring semester, Dr. Wood offered Biology 103, an elementary course in the taxonomy of vascular plants. The staff gave three summer school classes: two in Jamaica Plain, and one in Florida and Massachusetts. Drs. Wood and Howard taught S-105, Plants in the Tropics, using the Fairchild Tropical Garden in Coral Gables, Florida, as headquarters for three weeks of laboratory and field work, followed by a week in Cambridge using the herbarium and library. Biology S-109, Taxonomy of Cultivated Plants, was taught by Dr. Weaver; and S-110, Principles of Practical Horticulture by Dr. DeWolf. Both courses were held in the Administration Building in Jamaica Plain and on the grounds of the Arboretum. Drs. Howard, Schubert and Wood supervised the work of graduate and undergraduate students in research courses, or served as advisors to undergraduate students in the Department of Biology. Dr. Sponberg was in charge of the seminar programs in systematic botany held in Cambridge.

Noncredit courses consisting of lectures and laboratory work were held in Jamaica Plain and in Weston. The staff offered courses in practical gardening for the homeowner, introduction to plant identification, nature photography, and plant biology for teachers; also, field classes in ornamental woody plants. Mrs. Julian Underwood, a member of the Visiting Committee, conducted a series of workshops on garden design and construction; and Mrs. Ara Derderian, three courses on bonsai. Two lecture series were held in Weston at the Case Estates: a series by members of the staff, and another by members of the Friends of the Arnold Arboretum. Open houses were held at Jamaica Plain and Weston, and a special pruning demonstration attracted eighty people on a rainy day in Weston.

The horticultural staff of the Arboretum prepared an exhibit on abnormal and dwarf conifers for the N. E. Spring Flower Show of the Massachusetts Horticultural Society, receiving five major awards. Special exhibits were staged in three areas: the Peabody Mall, Brookline Village, and Boston Common, in conjunction with Earth Week programs in April. When the local merchants sponsored sidewalk educational exhibits and displays in Jamaica Plain, Mercer Fellow James Wolpert manned an exhibit of plant propagation using home materials.

Three exhibits were staged in the lecture room of the Administration Building: an exhibit of water color paintings by Catherine Hammond; paintings, sketches and photographs of East Africa by Karen Velmure, a member of the staff, and her husband; and an exhibit of poisonous plants prepared by the staff.



Arboretum field class. Photo: P. Bruns



Potting a bonsai in Mrs. Ara Derderian's class. Photo: P. Bruns

The Arboretum has offered guided tours to visiting groups; most of these are conducted during the spring flowering season. Volunteers now have been trained to conduct tours for garden club groups, and are effective in this role, relieving the staff for other duties. Other groups requiring more highly trained leaders, or with special needs, are served by members of the staff. During the past year, classes from seventeen colleges visited the Arboretum for tours of the grounds, the greenhouses, and the herbarium, or for special lectures by the staff. We also receive many requests for lectures by the staff away from the Arboretum. A few of these can be handled by Volunteers showing the films produced by the Arboretum. Others are met as individual staff schedules permit, or in association with other

Photography class member focuses on the tree peonies. Photo: P. Bruns





travel. Dr. Howard was in Hawaii for a biennial meeting of the Scientific Advisory Committee of the Pacific Tropical Garden, and lectured to the Honolulu Garden Club. He combined this planned travel with a stop in Texas to discuss the creation and maintenance of botanical gardens with guests assembled by Texas A&M University. At that time he was able to lecture to classes at the University and to a garden club of the area. Mr. Fordham took part in a short course at Ohio State University, and presented two papers on dwarf conifers and juvenility in plants. He also presented two papers at the meeting of the International Plant Propagators Society in Chicago, in addition to chairing one session. Drs. Spongberg and Wood represented the Arboretum at the First International Congress of Systematic and Evolutionary Biology at Boulder, Colorado, and both presented papers during the meeting. At a regional meeting of the A.A.B.G.A. held at Swarthmore College, the program chairman was unable to obtain a speaker for the negative regarding the value of herbaria to arboreta. Dr. Howard filled this role, with Dr. John M. Fogg, Jr., of the Arboretum of the Barnes Foundation, taking the affirmative. Since both speakers know the value and the problems of maintaining herbaria, the discussion was for the benefit of the audience.

In early spring, an education film on Poisonous Plants was completed and released. Peter Chvany, who made the Centennial Film on the Arnold Arboretum, was also the producer and photographer for this film. Subsequently, it has had a wide showing to hospitals in the Boston area, and to many organizations, including the 1974 summer school. It also has been entered in film competitions, and we have received three offers from film distributors to handle sales and rentals. An issue of *Arnoldia* was devoted to the topic of Poisonous Plants to supplement the information in the film. Dr. Howard was a guest on two commercial TV programs: the Sonya Hamlin Show and the medical program entitled House Call with Dr. Tim Johnson; both appearances resulted in requests for copies of the reprinted *Arnoldia*.

Travel and Exploration

International travel of the staff was associated with their various research programs, while domestic travel was primarily to attend scientific and professional meetings. Dr. Wood collected materials for the generic flora project in Florida while teaching a summer school course. In the fall, Dr. Weaver made a trip to North Carolina seeking members of the Gentianaceae;

Dr. Richard E. Weaver, Jr., assisted by Volunteer Mrs. Elinor B. Trowbridge, conducts Harvard Summer School class in Biology S109, Taxonomy of Cultivated Plants. Photo: P. Bruns

and in midwinter, to Costa Rica and British Honduras where he secured tropical representatives of the family. Mr. Pride brought back living specimens for teaching and research from his travels to Dominica, Costa Rica and British Honduras. Dr. Howard traveled to the Dutch Antilles, visiting St. Martin, St. Eustatius and Saba, with a stop in Puerto Rico. He also accompanied Dr. Yeo of Cambridge, England, to Campobello and the Wolf Islands of Canada, and made collections of the cultivated plants of the International Park. Dr. Gillis was able to visit several of the Bahama Islands and the Turks and Caicos group for field work. He also made a trip to England for herbarium study. Mr. Fordham participated in the International Plant Propagators Society tour of England and Holland, visiting many gardens and commercial nurseries.

Volunteers

The contributions in service to the Arnold Arboretum by a faithful group of Volunteers have been of tremendous significance during the year. We call on these willing people for regular duty or for special events, and their help is greatly appreciated. During much of the year this help was arranged by Ms. Joyce Fantasia, who unfortunately could not continue. She has our gratitude for the many hours she did contribute.

Most of the tours of the grounds for garden clubs are now conducted by members of the Volunteers. They also help in the library; staff the open days at the greenhouse; assist with general duties in plant propagation and the inventories of the nursery areas; collect and prepare herbarium specimens from plants on the grounds, and eventually file these in the herbarium; read proof and correct galleys of manuscripts; assist in revising our computer printout records of the living collections; catalogue and recondition the collection of kodachrome slides. They also assist staff members in their research programs in various ways, from literature searches, and the preparation of illustrations, to making chromosome counts of seedlings and flowers. The wife of a visiting professor from Switzerland volunteered her services, and her translating skills were used in the library and the herbarium. One Volunteer supplied by "RSVP," the Retired Senior Volunteer Program of Boston, is a regular secretarial assistant. Several of the Earth Day programs were staffed by the Volunteers, as was the Woman's Lib Day exhibit, "Yes We Can," from which male Volunteers and staff members were excluded. One of the permanent exhibits in the



Snow-covered Azalea seed capsules. Photo: P. Bruns

Administration Building drawing admiration and attention is a collection of flowers and fruits attractively embedded in clear plastic. This is the continuing contribution of one Volunteer. The blocks are useful not only for teaching in classes and in plant identification, but also have been used in many temporary displays elsewhere which call attention to the Arnold Arboretum.

We stand in amazement with deep gratitude for the many talents available to the staff in the Volunteer program.

Gifts and Grants

The staff of the Arnold Arboretum is grateful to many individuals and organizations for gifts of money and of material objects which support our general activities. The members of the Friends of the Arnold Arboretum are regular contributors to an appeal for support. The basic fee for single membership was increased to \$15 this year, and the Friends responded in kind with many increasing their contributions in recognition

of the fact that inflation affects the Arboretum as well as individual consumers. We are particularly appreciative of a gift from Mrs. Alan Cunningham which has been used to redesign and landscape the top of Bussey Hill, making it an attractive overlook of the grounds with educationally useful plantings for many seasons of bloom.

Memorial gifts are gratefully received, and are used as requested. A plant on the grounds may be marked with an appropriate small metal embossed label, indicating the donor and the one memorialized. A book for the library or a special piece of equipment purchased with the gift may be similarly marked. Memorial gifts were received in the names of Mrs. Peter Boshco, Loring Conant, Sr., Virginia S. Jewett, Lowell Trowbridge, and Mrs. Frances Williams.

Plants for research, or for use on the grounds, were donated by Mr. Charles L. Austin, Mr. and Mrs. Robert W. Corson, and Mr. and Mrs. Don Smith. We acknowledge with gratitude the generosity of many nurserymen who fill our requests without charge or with generous discounts.

The film on Poisonous Plants was completed largely with gifts from the Friends of the Arnold Arboretum, but special gifts for this purpose were received from the George I. Alden Trust and the Smith, Kline and French Laboratories. A Japanese stone lantern was a gift of Maynard J. Lebowitz in memory of his parents. This lantern, in the Gyoen style, stands in the bonsai house, replacing an older one which was badly deteriorated and crumbling.

The Massachusetts Council on the Arts and Humanities supported our program of rare book restoration. Mrs. Julian Hill donated a valuable printout of the living collections of the Barnard's Inn Farm. Books for the library collections were received from Mrs. Ara Derderian, Samuel E. Weir, Q.C., Mr. Charles Mead, Mrs. Percy Merry, Mr. J. Newfield, and Mrs. Richard Warren.

We received two gifts in support of work toward a revision of Rehder's *Manual of Cultivated Woody Plants*: one from an anonymous donor, and one from the Rare Plant Group of the Garden Club of America.

A grant from the Tozier Fund was made to Dr. Schubert for the purchase of a Polaroid MP-4 camera for staff use in the Herbaria Building in Cambridge.

A collection of excellent kodachrome slides of plants of southeastern United States was donated to the University by Dr. Wil-

liam S. Justice for use by Dr. Wood in teaching and in the generic flora project. We received another collection of slides from the estate of Mrs. Edith Hausman.

Work on the flora of the Bahamas, undertaken by Research Fellow Dr. William Gillis, has been supported by anonymous gifts. Grants for field work in the area were received from the National Geographic Society and the Society of Sigma Xi.

Publications

Four numbers comprise each volume of the *Journal of the Arnold Arboretum*, and the four numbers issued during the fiscal year totaled 495 pages. Twenty-three articles by 31 authors were edited by Dr. Bernice Schubert, with the aid of Miss Kathleen Clagett as editorial assistant. Due to labor problems in the Harvard Printing Office, the publication schedule during 1974 was delayed. The labor situation has been resolved, and the *Journal* should return to its regular quarterly appearance.

An *Index to Authors and Titles*, Volumes 1 through 50, 1919–1969, for the *Journal* was compiled by a former editorial assistant, Ms. Ellen B. Bernstein. The *Index*, with an introduction by Dr. Schubert comprising a history of the *Journal* and a table of publication dates, was issued as a separate publication of 74 pages in July of 1973.

The six issues of *Arnoldia* totaled 268 pages, and were edited by Mrs. Jeanne Wadleigh with the assistance of Miss Pamela Bruns as art director. A special number paralleling our latest film was devoted to the subject of Poisonous Plants, and was reprinted for separate sale. In order to meet the public demand for this handbook, copies have been placed in selected book stores and garden centers.

The production schedule of *Arnoldia* also suffered as a result of the prolonged strike at the Harvard University Printing Office. Publication now is returning to normal.

RICHARD A. HOWARD

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* Former Staff Member



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* Deceased October 8, 1973

** Appointed jointly with the Gray Herbarium

+ Resigned June 7, 1974

++ Resigned January 31, 1974



Notes from the Arnold Arboretum

WEATHER STATION DATA — 1973

Average temperature for 1973: 52.4°
Precipitation for 1973: 48.51 inches
Snowfall during winter 1972-73: 14.6 inches
Warmest temperature: 101° on Sept. 1
Coldest temperature: 0° on Jan. 8
Date of last frost in spring: April 15
Date of first frost in autumn: October 22
Growing season for 1973 was 189 days

	Avg. Max. Temp.	Avg. Min. Temp.	Avg. Temp.	Extreme Max.	Extreme Min.	Precipi- tation
Jan.	40.5	20.8	30.7	64	0	3.70
Feb.	37.0	19.4	28.2	56	1	2.43
Mar.	51.5	33.4	42.5	68	17	2.41
Apr.	59.9	40.3	50.1	89	27	6.19
May	67.2	46.8	57.0	87	37	3.95
June	81.5	60.2	70.9	98	44	5.04
Jul.	86.2	64.3	75.3	100	53	5.73
Aug.	87.0	64.9	76.0	100	54	2.97
Sept.	77.2	52.2	64.7	101	36	3.89
Oct.	66.4	41.4	53.9	82	32	2.89
Nov.	52.3	34.5	43.5	70	21	1.88
Dec.	45.7	26.6	36.2	62	7	7.43

* Growing season — The growing season is defined as the number of days between the last day with killing frost in spring and the first day with killing frost in autumn. This time is determined by the last spring and the first fall temperature of 32 degrees F. or lower.

EQUIPMENT USED AT THE ARNOLD ARBORETUM WEATHER STATION IN 1974

It seems reasonable to suppose that in years to come sophisticated and perhaps automatic apparatus will be used to compile the Arboretum's weather data. Those responsible for such equipment might be interested in the simple instruments used in 1974. Often routine procedures are taken for granted and go unrecorded. With this thought in mind, instruments presently used at the Weather Station are described here as an historical record.

Since August 15, 1962, the Arnold Arboretum has maintained a simple climatological substation in cooperation with the U.S. Weather Bureau. A representative of the Weather Bureau approved a site for the instruments, supervised their installation, and checked the thermometer for accuracy. Daily at 8:00 A.M., observations of temperatures and precipitation covering the previous 24 hours are entered on forms which the Weather Bureau provides.

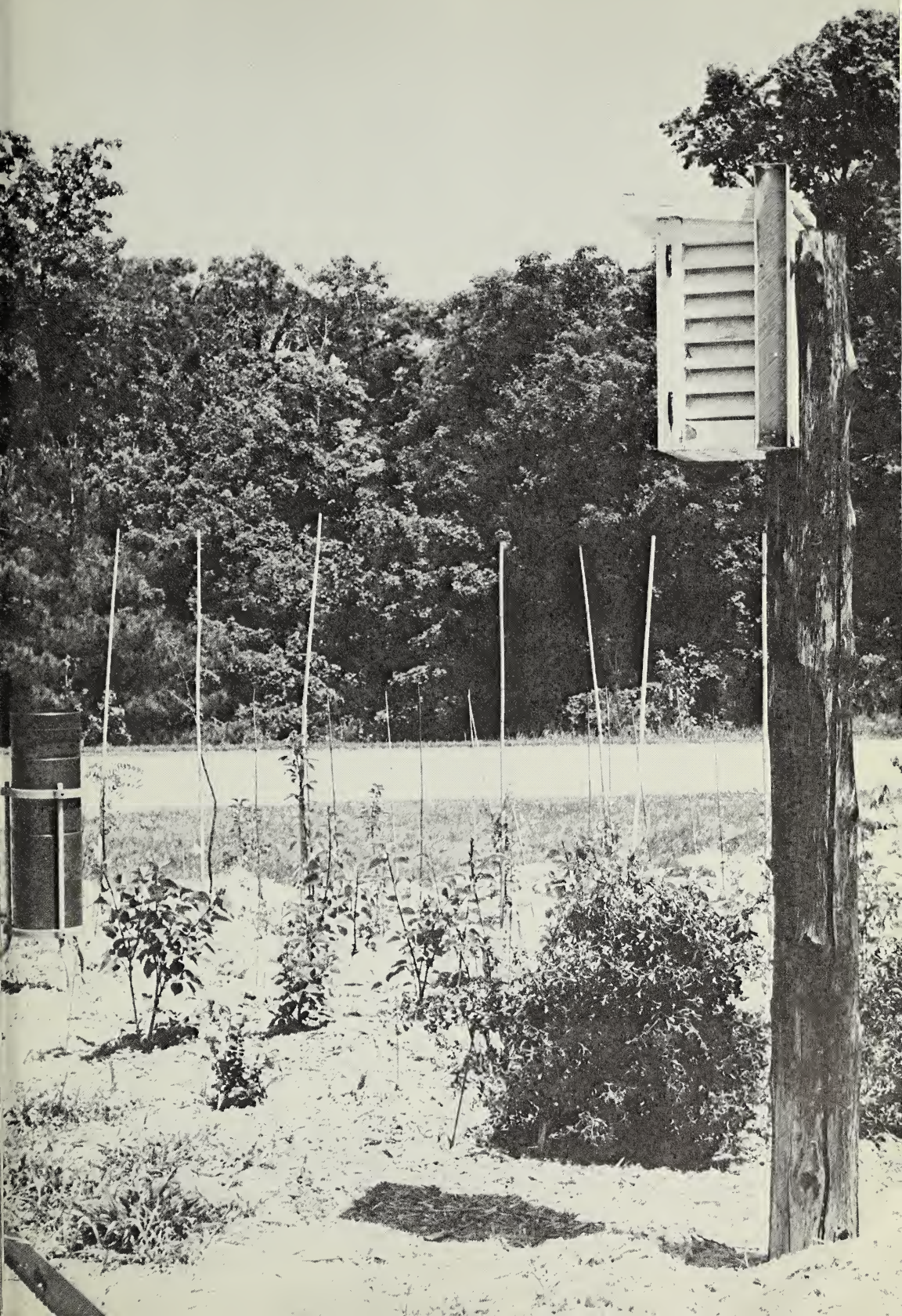
The equipment includes a maximum and minimum self-registering thermometer furnished by the Arboretum and an 8-inch non-recording precipitation gauge provided by the Weather Bureau.

Thermometer

The thermometer consists of a glass bulb filled with a substance that expands or contracts as the temperature increases or decreases. A connecting U-shaped tube contains a mercury column and an expansion chamber which takes care of the change in volume caused by expansion or contraction. A small steel pin known as an index has been inserted in the bore on each side of the U-tube. That on the left is used for making minimum observations; that on the right, for maximum readings. As the temperature increases the substance in the glass bulb expands, forcing the mercury column down on the left side of the tube and up on the right. Conversely, as the temperature decreases, contraction causes the mercury in the column on the left side to rise. In either case, the indices are pushed ahead of the mercury column. The indices fit the bore snugly enough so the maximum index remains at the highest point it has reached during temperature increases, while the minimum remains at the lowest point during temperature decreases. A magnet is used to reset the steel indices drawing them downward until they rest on the tops of the mercury columns.

Fig. 1 Shelter that houses thermometer is mounted on a sturdy post. It is designed so that air can circulate freely through it.

Photo: A. Fordham



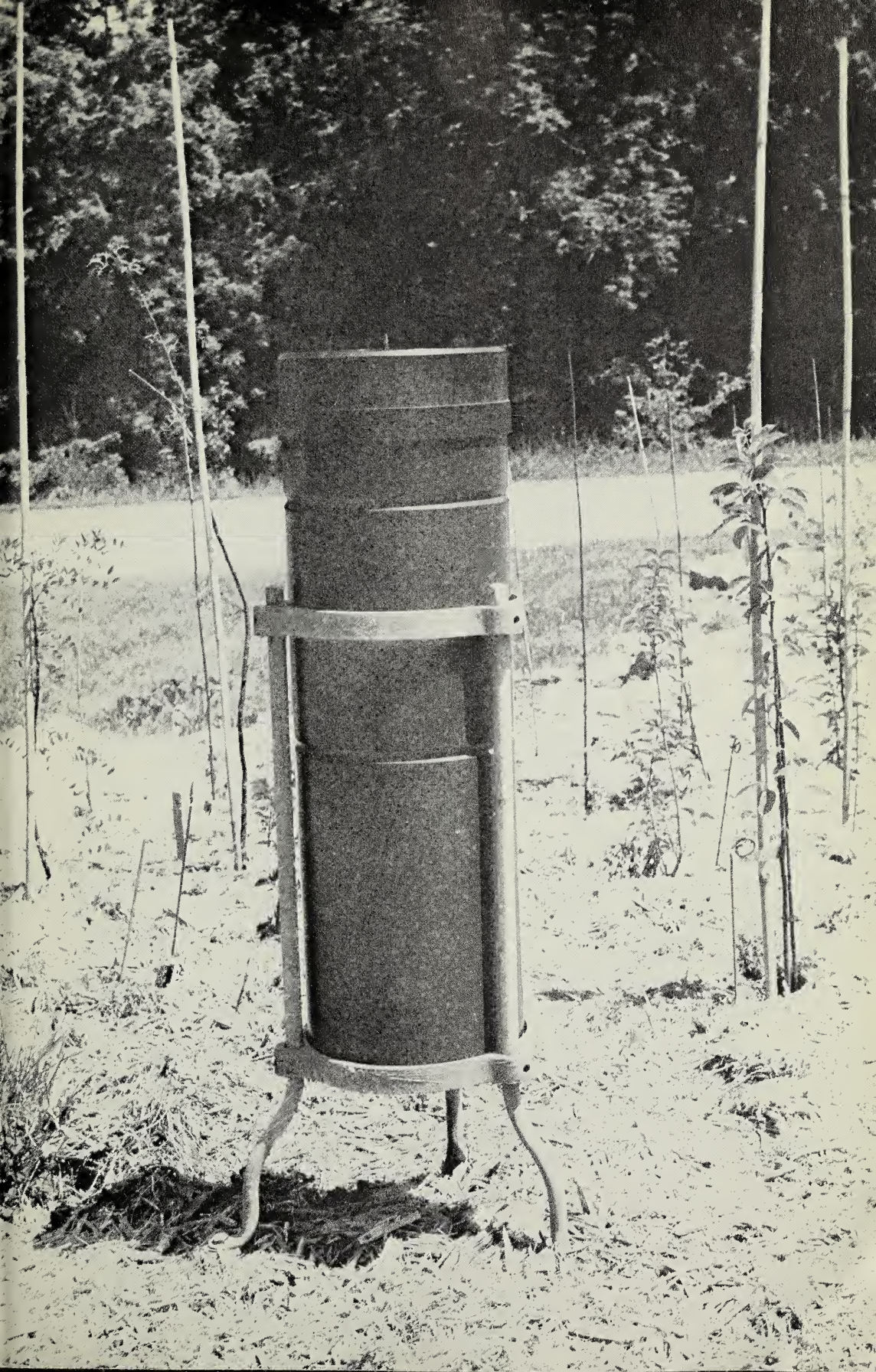
The small-sized ($8 \times 8 \times 17$ inches) shelter (Fig. 1), that houses the thermometer is designed so that air can circulate freely through it. Sides facing east and west are louvered so that rays of the sun cannot enter, while the door which faces north is screened. The back which faces south is solid. The sloping top is of double construction with an air space between the two parts. Thus the lower part is shaded by the upper, and air circulates between the two, averting any build-up of heat within the box through solar radiation. To make the unit reflective rather than absorbant, it is painted white within and without. The shelter is mounted firmly on a sturdy cedar post to minimize the possibility of the indices being moved through vibration caused by wind.

Eight-Inch Non-recording Precipitation Gauge

The 8-inch non-recording precipitation gauge is a simple, yet interesting instrument. (Fig. 2). It consists of a rainfall funnel, a measuring cylinder, an overflow can, and a measuring stick. The top of the funnel has a diameter of exactly 8 inches and its beveled rim is machined to a knife-like edge. It is designed so that only the portion of rain falling within the 8-inch diameter is collected and led to the measuring cylinder. This cylinder is exactly $1/10$ th the diameter of the rainfall funnel, and therefore the depth of rain that enters the cylinder is increased ten-fold. (One inch of rain becomes a column of water 10 inches high.) Increasing the column of water from 1 to 10 inches leads to a situation whereby it is possible to make readings using the measuring stick which is graduated in hundredths of an inch. The measuring cylinder, which is 20 inches tall, is designed to hold exactly 2 inches of rainfall. In the event that one day's rain exceeds 2 inches, the excess drops into the overflow can. When this happens, the measuring cylinder is emptied and counted as 2 inches. The funnel is then placed on the cylinder and water from the overflow can is poured into it. The process is repeated until the last pouring only partially fills the cylinder. By keeping track of the number of times the cylinder was emptied and by measuring the final partial filling, the total rainfall for the past twenty-four hours is determined.

During colder parts of the year, the rainfall funnel and measuring cylinder are removed and only the overflow can is left to capture precipitation. This is done as a precautionary measure because water freezing in the measuring cylinder could lead to

Fig. 2. Eight-inch non-recording precipitation gauge. It should be precisely levelled. Photo: A. Fordham

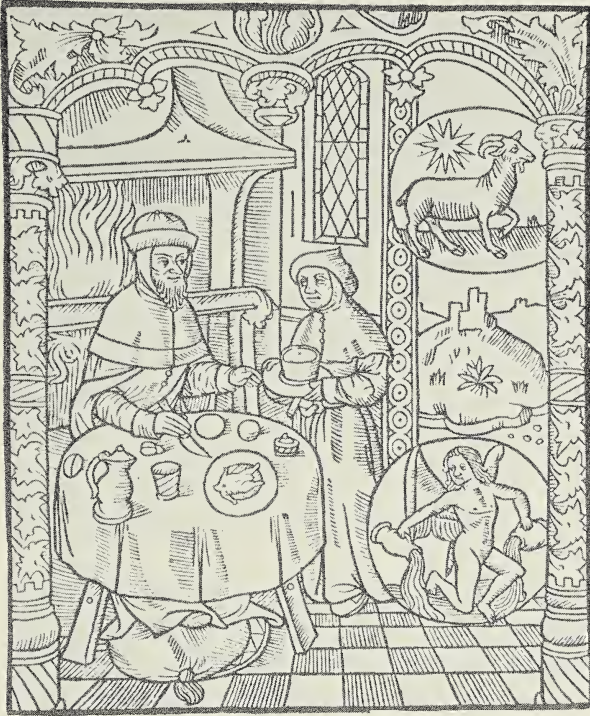


its distortion, making it inaccurate; or to its rupture, making it useless. During this season, precipitation caught in the overflow can is measured by pouring as described above. If the precipitation is in the form of snow, sleet or frozen rain, the overflow can is brought into a warm location to thaw before the water content is measured. In the event precipitation is still occurring at time of measurement, a known volume of hot water is used to thaw the contents quickly. The combination is then poured into a second vessel so the overflow can may be returned to its station without loss of time. The volume of added water is then poured off and the remainder measured.

The overflow can used to measure precipitation in winter might not accumulate wind-driven snow accurately. In this case it becomes necessary to collect a snow sample. To do this the observer chooses a site where the snow depth appears unaffected by drifting. By inverting the overflow can and using it like a cookie cutter, a cylindrical plug of snow is obtained. This then is processed as described above. When collecting snow of loose consistency, it may be necessary to slide a sheet of thin metal under the can so that the sample remains complete.

ALFRED J. FORDHAM

Arnoldia Reviews



January. From To Everything There Is A Season.

To Everything There Is A Season. Thalasso Cruso. New York: Alfred A. Knopf. 1973. 309 pages, illustrated. \$6.95.

Like its two predecessors, this book raises the question: for whom has it been written: beginning gardeners, old-time gardeners who seek polishing, modern ecologists of the lay variety, or for the author herself? Probably all are addressed, but Miss Cruso is primarily a spokesman for herself. The work is a subjective distillation of her newspaper columns in the form of essays bearing a calendar format, but in no sense a horticultural calendar. Much of the work is autobiographical and the recollections of her English childhood are seldom relevant to horticulture, but more sociologically and historically illuminating.

The work is splendid for the account of the evolution of an individual's development of horticultural acumen, emphasizing the "look it up," "try it another way" empirical approach to problems. Valuable portions deal with shopping for plants, repotting and growing-on techniques; devices like shaping a bough to order by weighting it with a bagful of stones; revelations that white-flowering pelargoniums (geraniums) are difficult to flower indoors; the desirability of abandoning greenhouse benches (advice with which this reviewer concurs). It's a fine book for reading in winter when you can't garden. Do not, however, buy it for your young niece who is on a hanging-philodendron-in-the-window kick. Said niece will not know what is being talked about, for this is *not* a work for the novice.

The writing in some areas is over-contrived. For example, an allusion to ". . . the red snouts of the peonies" was found far from felicitous. Nevertheless, this is a handsome, well-set volume incorporating a very useful index.

ELINOR B. TROWBRIDGE

Plum Crazy, A book about beach plums. Elizabeth Post Mirel. New York: Clarkson N. Potter, Inc. 1973. 144 pages, illustrated with drawings. \$5.95.

The beach Plum, *Prunus maritima*, native and restricted to the eastern shores of North America from Maine to Virginia, was described as new to science by Humphrey Marshall of Pennsylvania in 1785. Earlier the Pilgrims had described the fruit in letters to England, comparing it to damson plums. Explorers and travelers had encountered the plant, and a Hessian officer, fighting for the British in the Revolutionary War, had taken seeds to Germany. By the early 1800's several horticultural selections had been made and were offered by local nurseries. But in spite of its beauty as a flowering shrub, which also produces a useful fruit, the beach plum is infrequently cultivated in the 1970's.

Making beach plum jelly remains a cottage industry. Perhaps this charming book, well-written after much research, and illustrated with appealing drawings by Betty Fraser, will change all this. The plant deserves to be grown in home landscaping plantings, and Ms. Mirel's suggestions for the use of the fruit offer many opportunities for experimentation.

RICHARD A. HOWARD

Land Above the Trees: A Guide to American Alpine Tundra. Ann H. Zwinger and Beatrice E. Willard. New York: Harper and Row. 1972. 489 pages, 230 line drawings, 45 color plates. \$15.00.

Occasionally a book comes along that fills a complete void and is so excellent in its treatment that it will be difficult to improve upon it for a long time. This is such a book. It is the first comprehensive work dealing with the ecology of the alpine tundra of the United States. The areas covered in detail are the Colorado Rockies, the Sierra Nevada of California, the White Mountains in Great Basin on the Nevada — California border, Mount Hood and Mount Ranier in the Cascades of Oregon and Washington, the Olympic Mountains of Washington, and Mount Washington in the New Hampshire White Mountains.

Most of the many line drawings by Ann Zwinger are fine, but in a few cases some of the wispier ones would seem to be more useful in bolder outline. These drawings should be very helpful in identification of the plant material as was intended.

Sixty pages are devoted to a "comprehensive listing" of alpine plants giving the flower color, blooming time, type of habitat, distribution in the United States and throughout the rest of the world.

A brief glossary deals mostly with terms in the book associated with alpine conditions and there is a valuable series of references covering eleven pages.

This book should appeal to a wide audience consisting, at least, of rock gardeners, ecologists, botanists, artists, photographers and lovers of the outdoors in general.

The authors seem to feel that each plant should have a common name, and if none exists they have translated the scientific name literally, resulting in some odd epithets.

If your background in botany is so poor that you are not familiar with woolly kittentails, owl clover, mousetails, whitlow-worts, elephantelles, bastard toadflax, monkeyflowers, bladder-pods, billberries, pussypaws, eyebrights, chimneybells, viviparous bistorts, sticky sky pilots, louseworts, and kinnikinniks, and if you are unfamiliar with the genera, *Smelowskia*, *Leutkea*, *Lesquerella*, *Lloydia*, *Phyllodoce*, *Oxyria*, *Erysimum*, *Eritrichium*, *Thlaspi*, and *Zygadenus*, all is not lost. This book will fill you in. You will, also, be able to tell a fellfield and a solifluction terrace from a krummholz if anyone should ask!

GEORGE H. PRIDE

A Traveler's Guide to North American Gardens. Harry Britton Logan. New York: Charles Scribner's Sons. 1974. 253 pages, illustrated. \$15.00.

This directory of arboreta and botanical gardens in North America, including Hawaii, Puerto Rico, the Virgin Islands, and Canada, would be a useful book for interested travelers. It is illustrated with black and white and colored photographs of some of the gardens, and is alphabetized according to state and then by cities and towns within each state. Many national and state parks, famous nurseries, tourist information bureaus, and plant societies also are included.

There are several errors in the information given about the Arnold Arboretum, which might apply as well to other gardens and arboreta listed. I do not think this book is worthy of the price.

ROSEMARY WALSH

The ABC of Indoor Plants. Jocelyn Baines and Katherine Key. New York: Alfred A. Knopf. 1973. 192 pages, 300 full color illustrations. \$12.50.

As this book's title indicates, it is a primer. Its avowed purpose is to introduce the indoor gardener to the very basic information concerning propagation, cultivation, and growth characteristics of some 300 house plants. It carries the amateur beyond the usual philodendron, *Ficus elastica* stage, introducing him to many of the more exotic and rewarding, but still easily-grown genera.

Concise, descriptive paragraphs in large print accompanied by beautifully-reproduced and detailed photographs comprise the text. An outstanding feature is the use of a symbol system for plant requirements and characteristics. Incorporated in each paragraph, its simple diagrammatic illustrations eliminate redundancy in description. Index and glossary by which common names, botanical names, and families can be cross-referenced easily make the book most useful for the less-than-scientific reader as well as the more sophisticated house plant enthusiast.

What seems to be another coffee-table decoration at first glance, becomes upon inspection a delightfully informative working addition to the indoor gardener's library.

BARBARA O. EPSTEIN

Jamaica, A Vacation Guide. Ian Sangster. New York: Charles Scribner's Sons. 1974. 96 pages, illustrated. \$4.95.

This brief volume with some illustrations (black and white), maps, and uncomfortably small print, is an excellent guide to the island of Jamaica, before, during, or after a visit. The text is unusually and disarmingly frank in its discussion of history, race and color, modern social problems, scenic values or the difficulties of climbing certain hills, or visiting certain areas (take a compass, there will be no one to help you if you get lost.) I looked for a special section on botanic gardens, to no avail, for the data is scattered in area studies. My favorite spot, the Institute of Jamaica, deserves more emphasis. Highly recommended.

RICHARD A. HOWARD

Environmental Boomerang. Leonard J. Webb. Australia: The Jacaranda Press. 1973. 126 pages, illustrated. \$3.85. (Available in the United States from Richard Abel & Company, Post Office Box 4245, Portland, Oregon 97208)

The catchy title supports the fact that man's misuse of his environment will return to challenge his ability to survive on this planet. Webb calls this "a problem without boundaries"; this volume is written for Australians about Australia. Five case histories are presented on the topics of soil erosion, killing of wildlife, water pollution, air pollution, and sensory stimuli and stress from noise and crowding. The illustrations are frightening graphic documentation. The author is very practical in discussing "the Criteria for Conservation," and the book ends with an excellent summary of "Ecological Principles in Practice."

This short volume is a forceful treatment of the subject by a competent scientist who is concerned about his homeland. The same text could be written for the United States, yet those who tried have not had comparable success. We recommend that you read *Environmental Boomerang* and take heed.

RICHARD A. HOWARD

Greenworks. Judith Handelsman and Sara Baerwald. New York: Macmillan. 1974. 182 pages, illustrated. \$5.95.

This is an arch, infantile, breathless, ungrammatical, overly-enthusiastic manual on how to grow the particular plants that the young authors coincidentally vend somewhere in Manhattan. It is tedious in its overuse of such epithets about the plants as "perky, bouncy . . ." The term "hardy" is frequently used when apparently "durable" is intended.

The book is written in the first person by two authors who exude an awareness of the state of ignorance in which they took up minor horticulture; a state in which this reader feels they remain. This is unkind; actually this is the book to buy for that young person who is pulsating with "good earth" identification and has the pocketbook to go into the Schefflera/Maranta/Tradescantia route of self-expression. In case you think I am too brutal, try this quotation: "(Scales) . . . remind me of shiny turtle-like warts." In the jargon of the authors, if you are over twenty-five this work will drive you up a wall although you are not a vine. If you are younger, this little manual may satisfy your immediate horticultural needs.

ELINOR B. TROWBRIDGE



Wandering Jew. From Greenworks.

Conradi Gesneri Historia Plantarum. H. Zoller, M. Steinmann, and K. Schmid (eds.). 1972. Zurich, Switzerland: Urs Graf-Verlag Dietikon. 106 pages, illustrated. \$250.00.

Conrad Gessner (1516–1565) was called by Cuvier the Pliny of the Middle Ages. He was variously Professor of Greek at the University of Lausanne, Professor of Philosophy and Professor of Natural History at the University of Zurich. Among his accomplishments were a *Bibliotheca Universalis* one-volume folio, 1545, in Latin, Greek, and Hebrew and *Mithridates de differentiis linguis*, 1555, an account of about 130 languages with the Lord's Prayer in 22 of them!

Among biologists Gessner is remembered for an *Historia Animalium* (1551–1558) published in four volumes folio. He planned a companion *Historia Plantarum* but this was never published due to his death from the Plague. Various of his illustrations were used by Kaspar Wolf and Joachim Camerarius the Younger. In 1751–1771 Casimir Christoph Schmiedel edited two volumes containing some 74 of his illustrations. The entire corpus of Gessner's materials was acquired by the Library of the University of Erlangen where it still remains.

The present volume printed in the German language and in folio format, with pages $18 \times 12\frac{1}{2}$ inches, is a sumptuous presentation of some 27 leaves of water colors from the Erlanger collection. The reproduction is superb. The critical apparatus, transcription, identification, and annotations seem to be full and accurate.

Five hundred and fifty numbered copies have been printed. Most, no doubt, will be purchased by libraries. It is to be hoped however, that there still remain a few private individuals who appreciate beauty and revere the names of famous men.

GORDON P. DEWOLF

Gardening With Wild Flowers. Frances Tenenbaum. New York: Charles Scribner's Sons. 1973. 206 pages, illustrated. \$7.95.

The cliché "you can't tell a book from its cover" truly applies to this volume. A major error in identification relates to the colorful jacket and is repeated on page 139. The plant at the left, partially cut off in reproduction, is the "native blue elderberry," not the "exotic-looking tall plants in the center" which

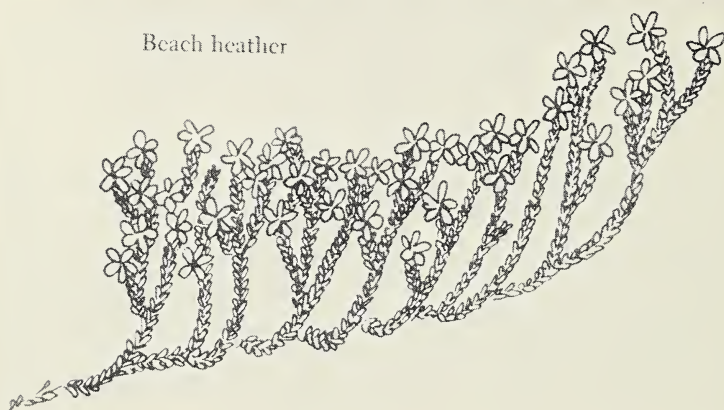
are a member of the Umbelliferae, *Heracleum mantegazzianum*, from Europe.

The author has accepted a broad definition of "wild flowers," including many plants native to foreign lands, that have become established in America as weeds or escaped garden plants. Horticultural varieties are often confused as "wild flowers" in the text and the illustrations.

The gardening aspect of this book has been divided into chapters of application as ground covers, ferns, woodland gardens, seashore gardens, meadows and ponds and bogs, and in basic chapters on culture of wild flowers, as well as collecting and buying. A chapter on "poisonous plants and edible plants" is well written but no supporting references are given there, and only one on poisonous plants appears in the "selected bibliography." Many plants are mentioned in several categories and described in detail but once. When used subsequently in the text, the plant name is followed with an asterisk indicating a discussion elsewhere which causes the reader to refer to the index. Rarely does one criticize an index, but this one, essential to the use of this book, is woefully inadequate. The plants mentioned under "meadows," for example, are not included in the index and other references are lacking.

The author is frank in stating what is included and what is omitted from this book. The information given is based on her own experience and herein lies the value of this volume. It is a useful book for the beginning gardener who wishes to use wild flowers in appropriate garden locations and needs to know their culture and propagation.

RICHARD A. HOWARD



Beach Heather. From Gardening With Wild Flowers.

Terrarium Gardening. Jack Kramer. New York: Charles Scribner's Sons. 1974. 146 pages, illustrated. \$9.95.

The Complete Book of Terrariums. Charles Marden Fitch. New York: Hawthorne Books, Inc. 1974. 150 pages, illustrated. \$8.95.

Fun With Terrarium Gardening. Virginie and George A. Elbert. New York: Crown Publishers, Inc. 1973. 144 pages, illustrated. \$5.95.

It is difficult for an author to come up with anything original when he is writing on a subject as popular as terrariums. In fact, judging from the covers of these three books, it's even hard to find a distinctive title.

Each of the authors under scrutiny covers the standard topics: types of terrariums and their selection, how to plan and assemble, accessories, types of plant materials, care after planting, and sources of supply.

Jack Kramer is seriously at fault for not stressing the importance of proper light in the maintenance of all types of terrariums; in fact, he dismisses the matter with just a few lines, inaccurately suggesting that the "desert or tropical garden will tolerate more light, perhaps a few hours of late afternoon sun." He also falls short by giving only brief descriptions of the plants he recommends, without noting characteristics such as aggressive tendencies, need for dormancy, or special care. The book is beautifully illustrated with fine drawings and photographs, both black and white and colored. A detailed appendix with tabular lists of plants for various uses is included, but there is no index for ready reference.

Charles Marden Fitch has produced a good, basic guide that lives up to its title in most respects. His step-by-step planting instructions are clear and explicit, and he includes a useful section on propagating terrarium plants, as well as one on growing orchids which usually are not included in such plantings. The book is well-indexed, profusely illustrated, and offers a long and diversified list of recommended plants with useful notations on many.

The Elbert guide accurately and successfully delineates the pitfalls as well as the pleasures of terrarium gardening. Emphasizing artificial light culture, as might be expected (George Elbert is president of the Indoor Light Gardening Society of

America), *Fun With Terrarium Gardening* offers pertinent comments on the plants described, and details the actual building of a basic terrarium in 24 pages of how-to text and photographs. A section devoted to terrariums of many kinds focuses on their contents and explains how they were assembled; bottle gardens also are noted briefly.

JEANNE S. WADLEIGH

Wildflowers of Alabama and Adjoining States. Blanche E. Dean, Amy Mason and Joab L. Thomas. Alabama: The University of Alabama Press. 1973. 230 pages, illustrated. \$10.00.

This volume is a welcome addition to the recommended list of books on wildflowers of a state for local residents and visitors. The book will apply to Mississippi, Georgia, northern Florida and Tennessee. Every species is illustrated with excellent photographs in color well reproduced in soft tones; many of them are truly works of art. Dr. Thomas has supplied concise, easily read botanical descriptions offering flowering times, distribution, and comments on the plants' frequency or need for protection. The volume contains plates of line drawings illustrating the technical terms used; a glossary; and a combined index to common and scientific names. The plants are arranged by families in the sequence of more technical floras.

Dr. Thomas, now a university dean with administrative responsibilities, was formerly a member of the staff of the Arnold Arboretum.

RICHARD A. HOWARD

Lectures on Photomorphogenesis. H. Mohr. New York: Springer-Verlag. 1972. 237 pages. \$14.80.

Although beyond the interest of most readers of *Arnoldia*, we call attention to this volume based on a series of lectures given by the author at the University of Massachusetts. The emphasis of the volume is the response of the plant to light.

Various chapters have a bearing on horticultural practices and knowledge, such as the effects of light on the germination of seeds, the developments of seedlings and of pigments, and the induction of flowering. Work on higher vascular plants and ferns, fungi and liverworts is included. A bibliography of 303 titles is supplied. The volume is an excellent scientific review of the topic.

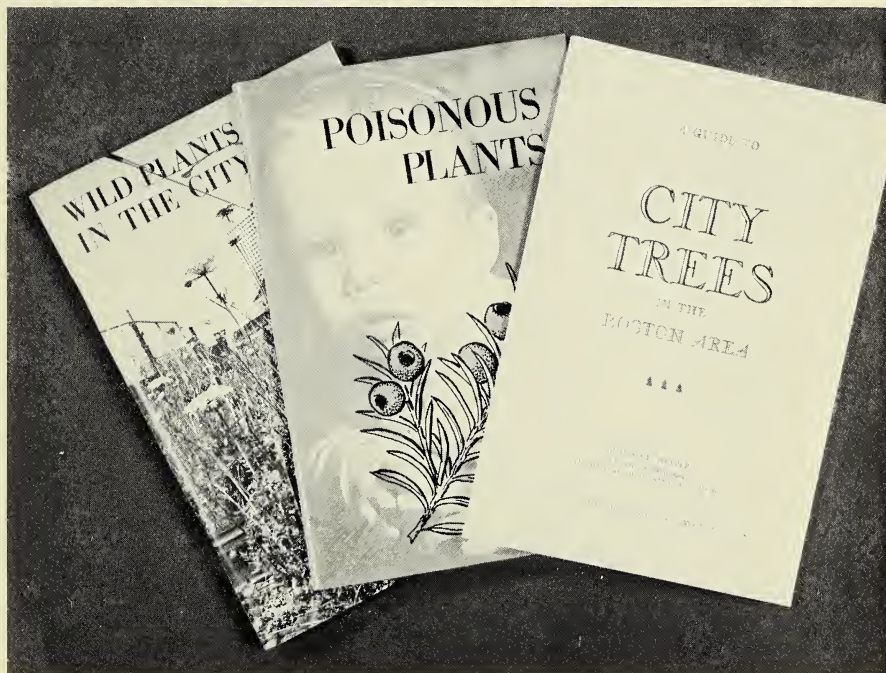
RICHARD A. HOWARD

RECENT *ARNOLDIA* REPRINTS

City Trees — 38 pages, illustrated, with key. \$1.00.

Poisonous Plants — 55 pages, illustrated. \$1.00.

Wild Plants in the City — 115 pages, illustrated, with key. \$1.75
to Friends of the Arnold Arboretum;
\$2.00 to others.



Due to rising costs, it has become necessary to increase the subscription rate of *Arnoldia* to \$8.00 per year, effective January 1975.

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